

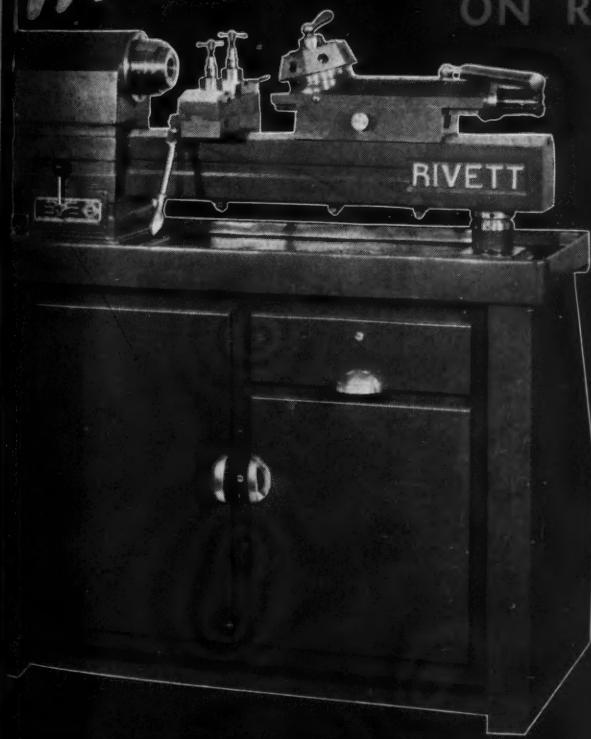
MODERN Machine Shop

August, 1940

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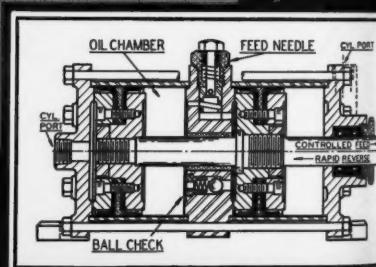
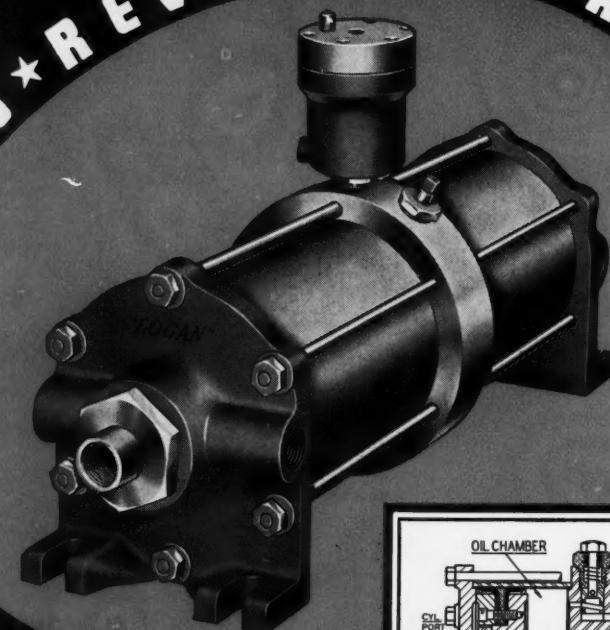
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MODERN Machine Shop

HOWARD CAMPBELL, Editor

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AUGUST, 1940

Number 3

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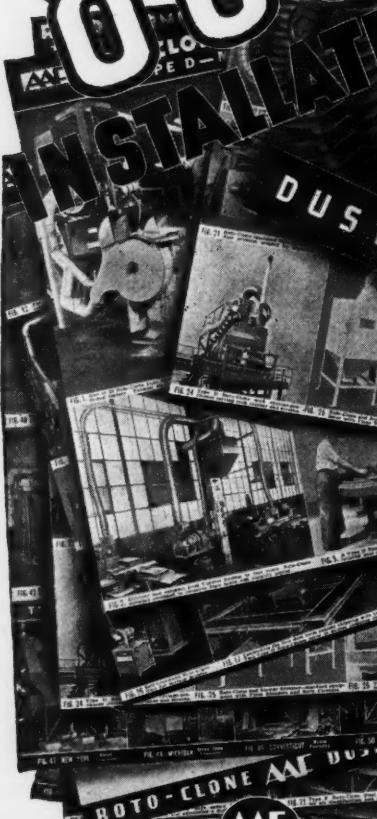
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MODERN Machine Shop

CINCINNATI, OHIO

AUGUST, 1940

VOL. 13. No. 3

We Present...

—as this month's feature the story of an unusually interesting development in the production of engineering drawings. It makes possible great savings in time and expedites production in one of America's great airplane plants. Actual-size drawings, made in a few minutes, can be used as patterns and templets in shop production.

—the first of a series of articles presenting some new ideas concerning the advantages of carbide tools. With the demand for top speed in our preparedness program, carbide tools assume a place of new importance in machine shop efficiency and the author of this series quotes examples and figures to show that carbide tools are as important in the small shop and on small lots as in the big shop on large lots.

—a review of the entire field of surface finishing under the title "Micro-finish—What It Is and How It Is Used." The information contained in this article will be of value to every engineer and machine designer.

—in the section "Modern Equipment at Work" a picture and description of a periscope in use—not for destruction—but for construction purposes. In the building of the huge mechanical units for which the Allis-Chalmers Company is noted it is imperative that the parts in these units be sound beyond any question of a doubt. By using a periscope, the inspector is able to see into places that would otherwise remain a dark mystery.

—in the "Ideas From Readers" section a simple solution to a fairly difficult measuring problem, the story of another trick that saved the day in an oil-field breakdown, and some other useful ideas. Many of our readers tell us that the whole magazine should consist of these "ideas," but we haven't been able to agree with them thus far.

—many new time-saving and cost-cutting machines and tools in the "New Shop Equipment" department, and the usual cartoon by Wesser.

Don't overlook the "Where to Find It" section, which begins on page 224. This section will help you to find, immediately, sources of supply for tools you are looking for.

Huge Camera Speeds Production on Martin Bombers

By BARTLETT WEST
Staff Correspondent

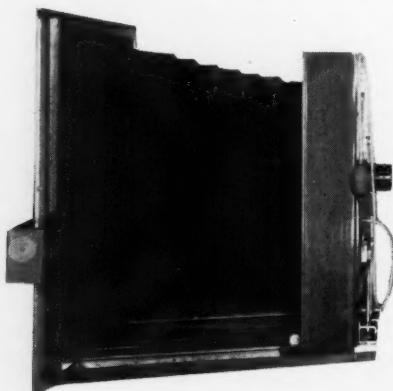
ACAMERA of huge dimensions with which the lines and figures of a mechanical drawing can be transferred, full size, to sheets of aluminum alloy metal to serve as duplicate drawings or templets has become an important part of the equipment in the engineering department of The Glenn L. Martin Company, Baltimore, Maryland, manufacturers of Martin Aircraft.

In the production of the huge airplanes which comprise the product of this company, many duplicate drawings are necessary in order that the work of the purchasing, tool-making, manufacturing, and assembling departments may be coordinated and expedited, and templets are necessary equipment in the layout department and in the "loft" where the

full-size layouts of the planes are made to ensure accuracy in erection.

With the aid of this unique piece of equipment, engineering drawings on white-coated aluminum alloy sheets are reproduced, photographically, on surfaces of cloth, paper, wood, metal or other materials. Nearly all Martin drawings are on these sheets, which are proof against atmospheric and temperature distortions. The process is credited with having a large part in expediting the factory's mass production methods, and is expected to find application in many other branches of industry.

Inasmuch as more than 1,100 engineers are included in the force of more than 12,000 people who comprise the organization of The Glenn L. Martin Company's Baltimore fac-



Using a sensitized sheet of aluminum as a photographic plate, this huge camera makes full-scale reproductions of original layouts for use as templets, as a basis for tooling or in production planning, and in many other ways. The aluminum "plate" can be as large as 5 x 15 feet in size. The original layout is set up at the correct distance from the lens to obtain an exact-scale reproduction. A negative can be obtained in a few minutes. The negative may be relatively small, but in projecting the image back, the distance must be the same.



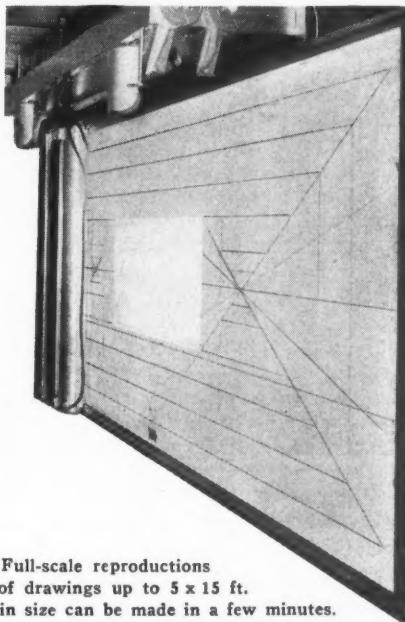
factory, with the company searching—at the moment—for hundreds more, the "camera draftsman" has been of inestimable value. Without it, the work and number of people employed in making drawings would be multiplied many times.

The size of the camera can be calculated from the fact that it has a 70-inch lens and reproduces in an outside dimension of 15 feet. As a matter of fact, up to the present time the maximum standard size of reproduction in use has been 5 x 15 feet, which simplifies the task of handling and transporting the "plate" about the plant. The plate is actually a sheet of aluminum alloy metal, the surface of which has been sensitized by the application of a special emulsion.

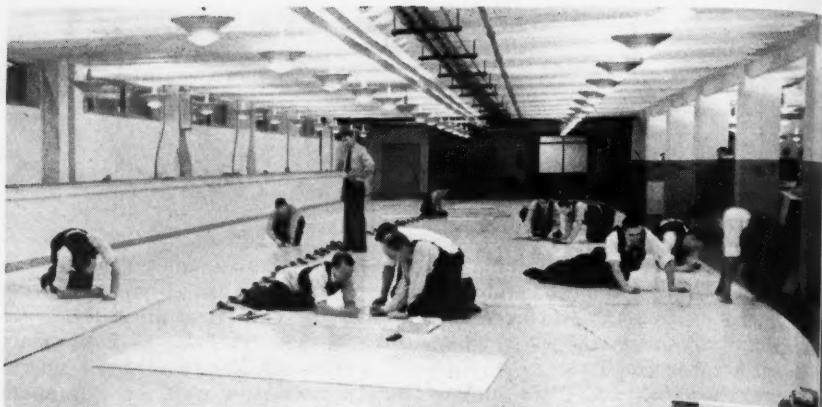
To take a picture, a master drawing is placed on a huge copying board before the camera and a negative is made. Then a sheet having a sensitized surface is substituted for the drawing and the image on the negative is projected back through the camera, reversing the process, and the plate becomes an exact-scale reproduction of the original drawing. After the picture has been snapped, the plate is transferred to one of four huge developing tanks, each holding 100 gallons of solution. In due process the drawing appears, full-size and to exact scale, in all its precision on the aluminum sheet.

The most important difference be-

tween the sheet metal, full-scale drawing and the usual paper drawing is that the metal drawing can be used to serve, immediately, as a jig plate for drilling or other machining operations, or as a templet, or section of a templet, for erecting operations. Of course, if it is to be used as a jig plate or layout templet, holes will have to be drilled where indicated, but the time required to drill the holes will be short indeed compared to the time that would have been required to accurately lay out and mark



Full-scale reproductions of drawings up to 5 x 15 ft. in size can be made in a few minutes.



General view of the "loft." Borrowed from the shipbuilding industry is this idea—a raised floor on which a whole airplane may be laid out in full scale, its contours sketched onto the floor itself. To the loft then come stress analysts and other engineers to fill in the details of bulkheads, stringers, spars, and other parts to bear the burden. The drawings are transferred to white-coated metal sheets in full scale and are then passed along to the photo reproduction process for the making of duplicates.

off the spots to be drilled.

Thus the fact that these exact-scale metal drawings are available promotes quicker starting and facilitates the making of changes when such changes are imperative. But that is not all. There are other places in the plant where the advantages of this versatile process are crystallized. Where an experimental airplane is to be built, the master drawings, absolutely accurate in every detail, can be photographed directly onto the base metal of which the ship is to be constructed and the parts cut directly from the metal itself. If a wind-tunnel or water basin model of a projected airplane is desired, the camera can be used instantly to scale down the lines from full size to an eighth or a tenth or any other desired fraction of the full size. An easy calibration of the camera turns the trick, saving perhaps weeks of re-drawing to scale.

Moreover, the huge camera is called upon to perform many other du-

ties. Besides projecting drawings onto tracing paper and vellum and wood, it is used to photograph typeset pages, with pictures in ink or pencil or half-tone photographs onto metal plates and these are specially treated by a process in which they become lithographic plates for rapid reproduction by the multilith method. And, of course, the camera is used to take ordinary photographs with the extra advantage of "blowing them up" on paper or canvas or wood paneling to sizes as large as 15 by 5-foot photo-murals.

An interesting application of the camera is its use in the "lofting" system used by the Martin Company. Borrowing the idea of "lofting" from the shipbuilding and automobile industries, this company has made a unique application of it to airplane building.

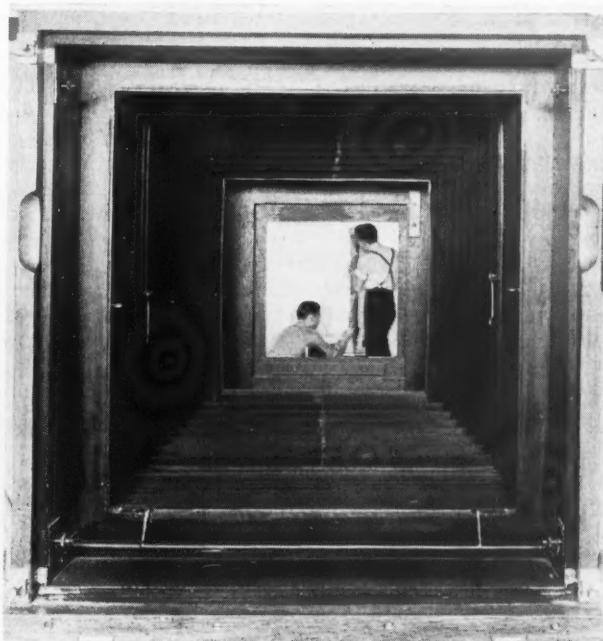
Down in the basement of the engineering building is a long, chalky white floor which is actually a superstructure, slightly raised above

real floor of the building. Here is the Martin "loft" where airplanes and airplane sections are drawn out in full scale by engineers who, wearing flannel window-dressers' slippers over their shoes, walk and crawl over the floor, measuring off and marking out the dimensions and locations of the various parts of the proposed designs.

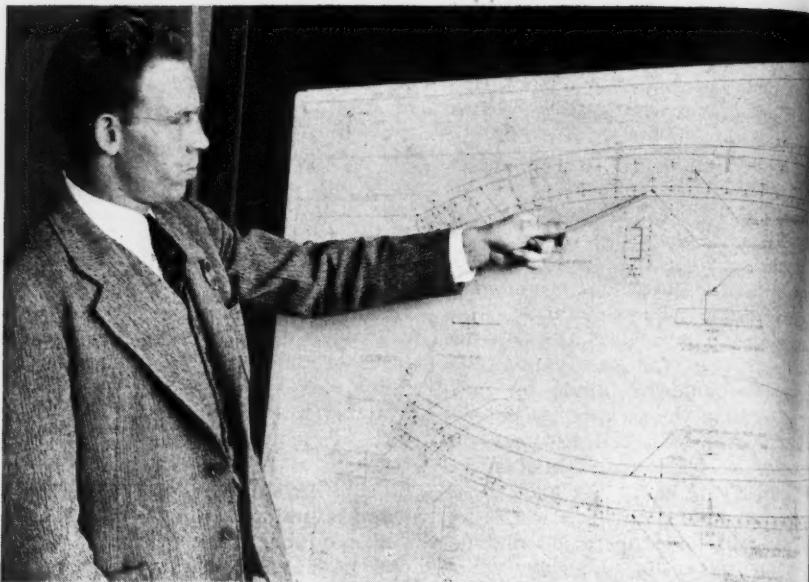
Here are born the sweeping contours and wind-cheating lines of new-winged ships. To this floor — big enough to accommodate the full-size outline of even the "airplane of tomorrow" — come all kinds of engineers to study the new design. Stress analysts examine each assembly to decide what trusses and braces will be necessary to carry the load. Production planners envision the shop and assembly line operation and develop mentally the plans by which the parts may be made to flow from

one machining operation to the next and to minor assembly departments and onto the assembly line. Tool designers note the machining required on the various parts and plan the tools and dies that will be required for each part, large or small. Details are sketched into the full-scale drawings.

And here is where the Martin photographic reproduction process steps into its busiest job. The sweeping outlines and contours of the ship are drawn on the loft floor, then the details of the many sections of the plane are drawn in but, instead of drawing these details on the floor, loft layouts are laid in position in the outlines and the details are drawn on the layout. A loft layout is a large aluminum alloy sheet coated white on one side so that a pencil can be used to draw the lines and figures. No ink is used for this work.



Looking from the back through the front of the huge camera in the Martin laboratories. At a predetermined distance in front of the camera the original drawing is being mounted for reproduction to exact scale. The drawing is reproduced on the "plate" which is a sheet of metal, wood, cloth, or paper which has been specially treated with photographic emulsion. The material itself thus becomes, in effect, a photographic print.



One of the reproduced drawings of an airplane section which was turned out in a few minutes where a drafted reproduction would have taken whole days and many men. The reproduction can be in smaller scale, as one-quarter, eighth, tenth, or any other fraction, obtained by simple calculation.

Few dimensional figures are necessary because the sections are in full scale. When a section drawing is completed on a loft layout, the layout is transferred down the hall to the big camera and as many copies as necessary are made on white-coated sensitized metal sheets that become duplicates, after which the original layout goes into the file as a permanent record.

And where do the duplicates go? Well, the tool design department gets at least one; sometimes more. One layout is laid over a sheet metal section of similar size and small holes are drilled around the outline of each part for which a tool or die must be made. When the layout is lifted off, the contours will be found clearly marked by the drill-holes in the metal sheet. These part forms are then cut

out of the sheet to become templates and are sent to the shop to be used in manufacturing. Other duplicates of the loft layout may be sent to the various sections of the production department so that constant check may be kept on the development of fixtures and the assembly of the parts. Other duplicates may go to the various classes of engineers to aid them in planning their work.

The many errors which are inherent in the old style of redrafting each loft layout several times is eliminated by the use of the new process. Once an original drawing has been carefully checked, no further errors can be made because each reproduction is exact. But changes may be made, if needed, directly on the reproduction. This feature has been an important one for, no matter

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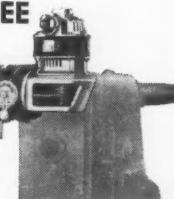


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In the Tool Design Department an immense saving in time in the design of tools and dies is effected because the photographed drawings, which are on sheet aluminum, can be used as layouts for drilling through sheet metal plates which then become templates.

careful a draftsman may be, it is practically impossible to duplicate a drawing exactly. His lines will always be found to deviate in some minor degree from the original.

ups." A "mock-up" is the full-scale model of every new airplane type which must first be built of wood to give engineers, tool designers, and production planners an opportunity to

No longer do craftsmen work from scale drawings in building fixtures, jigs, and similar tools. In many cases these are built directly on the full-scale drawings themselves, the workmen simply following the lines on the photographic print.



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study the design and discover any objective feature or opportunities for improvement before the plane goes into production; thus the ability of the "camera draftsman" to photograph drawings directly onto the surfaces of both painted and unpainted wood saves time and effort. Skilled craftsmen in Martin's big woodworking shop can work directly on many of the mock-up parts without constant reference to drawings.

Still another interesting function of the new process is in the making of "shrink layouts." Due to the fact that metals which are worked while hot, such as metals that are molded into dies, shrink considerably in the cooling process, it has always been necessary either to make new draw-

ings to allow for this shrinkage or to use a shrink-scale in machining the parts. However, the amount of shrinkage is a known factor; thus in using the camera to make a shrink layout a simple calibration is used which allows the lens to do in an instant what might consume many hours of time by older methods.

Throughout the big factory will be found data books and clerical forms from the camera's lithographic plates, and on Martin walls hang big pictures and colored canvas photographs of airplanes and other views—incidental work of the process. Undoubtedly the process will find broad application in many other industries which produce by mass-production methods.

The Story of Superfinish. By Arthur M. Swigart, Jr., Director of Production Research for Chrysler Division, Chrysler Corporation. Published by Lynn Publishing Company, Detroit, Mich. 672 pages, 6 x 9 in. in size, 720 illustrations. Bound in cloth board covers.

In this book the author presents, in perfectly understandable language, the history of a development that started with civilization—the development of metal surface finishing. The story, however, deals principally with the industrial development of metal surface finishing during the last three decades. Up to this time there has been no book written or data developed covering exclusively the subject of metal finishing that is of practical value to the engineer or mechanic in the production of refined metal finishes for wear elimination and increased load-bearing capacity. This knowledge has existed heretofore only in the minds of relatively few skilled men with whom it was a shop art.

This book was written to fill this need for technical and practical information. The book contains 21 chapters, beginning with a discussion of the importance of surface finish in metal manufacturing and consequently in the industrial development of the world and leading the reader on through the history of metal manufacturing and the

need created for better surface finish, to the first attempts at superfinishing, onto subsequent developments, and down to Superfinish as it is applied in a variety of industries today.

Chapter 5 deals with surface finish nomenclature and in this chapter the author presents an analysis of surface finish with photomicrographs of different kinds of finishes and specifications as to part, material, method of finishing, profilometer measurements, magnification and illumination for each one. In subsequent chapters the author deals with the different types of finishes that are obtained by the use of various types and kinds of machine tools and analyzes these surfaces. The subject "Metallurgy of Machined Surfaces" as presented in Chapter 16 comprises practically a condensed course in metallurgy. This is followed by chapters dealing with material and design of bearings, manufacturing advantages of Superfinishing, engineering advantages of Superfinishing, and a discussion of different types of Superfinishing machines.

Granting the point made by the author that "mechanical civilization moves upon its bearings," he has presented here a very good case for the necessity of better bearing finishes and the ability of the Superfinishing process to fill that need.

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The General-Purpose Use of Carbide Tools, I

System of Centralized Control is FIRST Essential

By JAMES R. LONGWELL

Chief Engineer, Carboly Company, Inc.
Detroit, Mich.

THOSE who look upon cemented carbide as a special purpose tool material, for use principally on quantity production jobs with occasional application on small-lot jobs where difficulties are encountered with ordinary tools, will be interested in the rapid spread of carbide tool use to the common, everyday, run-of-the-mine machining applications.

There are today many plants that employ carbides, not only for straight production work, but also broadly throughout the shop on short-run, job-lot applications covering a diversity of metals and machining operations.

So noticeable is this trend towards the general purpose use of carbide tools that there is a growing demand for information on the best procedure to follow in applying carbide tools for this purpose.

The objective of this and succeeding articles will be to outline broadly the basic requirements and most efficient procedure for the shop where it is desired to apply cemented carbide as a general-purpose tool material.

The following major factors will be considered in the order listed:

1. System of coordinated control.

2. Selection of applications; basic carbide tool requirements; operator education.
3. Selection of general purpose tools.
4. Selection of general purpose carbide grades.
5. Selection of speeds and feeds.
6. Carbide tool grinding and maintenance.

A review of all successful examples of general-purpose carbide tool use shows that a system of central control of tool application and maintenance is desirable when applying carbide tools broadly for general purpose use.

In other words, it is desirable that at least one individual be invested with authority and charged with the responsibility of seeing that proper and adequate carbide tool use and maintenance are carried out in the shop. In larger shops, this may be a full time job for one or more individuals. In small shops, it may occupy only a part of one man's time but in all shops—large or small—the responsibility should be delegated to an individual capable of exercising authority.

An outstanding example of the benefits of this centralized control

Appointment of at least one individual to coordinate and control all phases of carbide tool use is an essential to the success of the broad general purpose use of carbide tools in the shop. In the Warner & Swasey plant, J. MacFadyen, Tool Supervisor (left) has employed this system in applying carbides to approximately 1,500 small-lot jobs. Result has been a 43 per cent average increase in machine capacity on this highly diversified work.

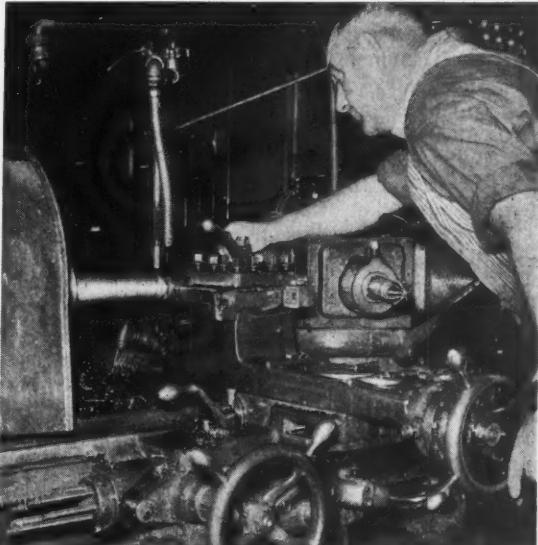


to be found in the Warner & Swasey plant in Cleveland, Ohio. In this plant approximately 1,500 jobs to date have been tooled up with Carboloy. The work is extremely diversified, with quantities ranging from 20 to 100 pieces per lot. Their records indicate that Carboloy tools have increased machine capacity on these 1,500 jobs an average of 43 per cent. Warner & Swasey will frankly tell you that one of the major contributing factors in the success of this broad use of carbides has been the early establishment of a unified

source of control, governing the design, application and maintenance of Carboloy tools.

The usual procedure in establishing a system of control for the broad application of general purpose carbide tools in the shop is as follows:

Inasmuch as the successful opera-



Bullard Company, machining lots of 6 to 200 pieces, has also successfully applied the method of using general-purpose carbide tools broadly throughout the shop. As a result, productive capacity of machines has been stepped up 33 per cent.

tion of any system depends upon the extent to which the intelligent co-operation and understanding of all concerned is secured, it is advisable at the outset to call a general conference of all management executives and supervisors concerned with machining production. At this meeting the objectives of the proposed carbide tooling program should be clearly defined and the part which each individual can contribute towards its success definitely outlined.

2. Establishing a Centralized Source of Control

At the above management conference, the individual (or individuals) who have been selected to act as the centralized source of control on all phases of carbide tool use in the plant should be identified by the management, and the broad duties of that controlling source clearly defined.

These duties usually cover the following major factors:

- (a) Selection of carbide tool applications.
- (b) Establishment of proper machine requirements.
- (c) Education of operators (where necessary) on proper carbide tool usage.
- (d) Design of broad-range, general purpose tools (including tool drawings and set-up layouts).
- (e) Supervision of the initial application and subsequent follow-up (if necessary) of all carbide tool operations.
- (f) Supervision of carbide tool grinding and maintenance.

Obviously the man (or men) selected for this important task not only must be an experienced mechanic, but also one who has had supervisory experience and is sufficiently "heavy" to carry the weight of authority in his numerous inter-departmental contacts. It is also es-

sential that the individuals selected have a thorough knowledge of the fundamentals of successful carbide tool use. In this respect, the various carbide tool suppliers can be of unusual service in assisting the man appointed to the task.

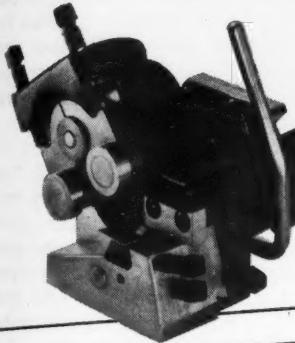
We have in our Detroit plant set-up especially designed to train men in the correct application and maintenance of Carboloy tools. It provides the "carbide man" sent here by the manufacturer an opportunity to secure complete, practical data based upon the accumulated experience of our organization over a period of more than ten years in the use of carbide tools. Service engineers are also available who are prepared to spend a period of time in the user's plant and assist the user's "carbide man" in establishing the basic control system required, when the extent of the work makes this necessary.

When this system of control has been established and the user's "carbide control supervisor" has become thoroughly familiar with the requirements of and operation of his duties, work may then proceed along the broad lines to be described in subsequent articles.

Some word should be said about the small machine shop employing from perhaps two to a dozen men in the shop. Many in this classification, doing small, job-lot work, have had the impression that practical carbide tool use was confined to the larger types of shops. For their benefit, I feel it is advisable to point out that the system of general purpose carbide tool use to be described is one that can be readily adapted to the requirements of the small shop. Indeed, such shops present the ideal condition for the general use of carbides, as the owner or "boss" is usually in close contact with all shop

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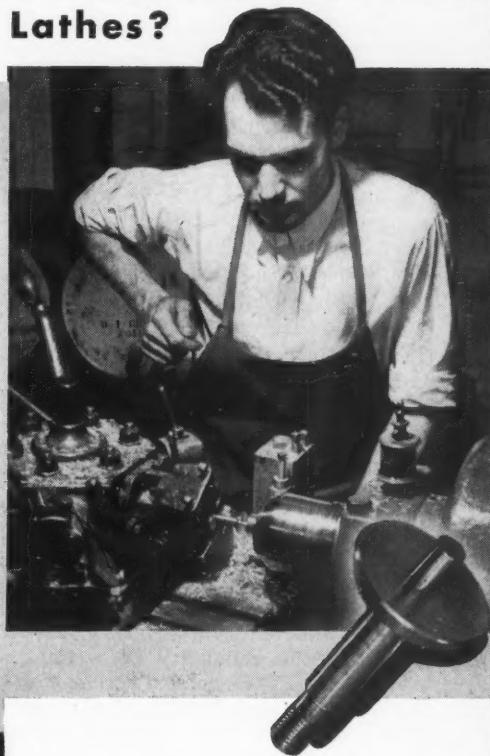


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1373 Nos. 3, 4, 5, 6	"	1 1/2	3/8	95.00
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activities and can in many cases personally supervise the introduction of carbide tool application in his shop.

(The second article of this series, to be published in the September issue, will discuss Applications and Basic Tool Requirements.)

Unshackle Arc Welding and Speed Progress

By C. M. TAYLOR

Vice President, The Lincoln Electric Company
Cleveland, Ohio

IT IS altogether absurd that a valuable and straight-forward industrial process such as arc welding, which has already created tremendous industrial and social benefits, and which will create still greater advances in the future, should be held back by restrictions and regulations which contribute nothing constructive but only serve to impede progress.

The worst feature of all restrictions is that the public many times questions the reliability of welding. As Mr. J. F. Lincoln, President of our company, pointed out in a recent article that was widely quoted, there is no mystery in welding. The properly trained and capable welder will consistently make welds stronger than the steel, just as properly trained and able machinists will consistently turn out work machined to the closest tolerances.

Does someone stand over the trained mechanic checking every nut he turns down to make a bolted connection?

Is the trained riveter beset by checkers and inspectors on every rivet he drives?

Is the trained machinist harassed by supervisors on every operation of his lathe?

Are all these trained craftsmen re-

quired to pass a test at frequent intervals to qualify for work which they have been doing for years and for which their experience and ability make them fully capable.

Is every single riveted and bolted connection individually examined, inspected and tested?

Obviously, the answer to all of these questions is "No!"

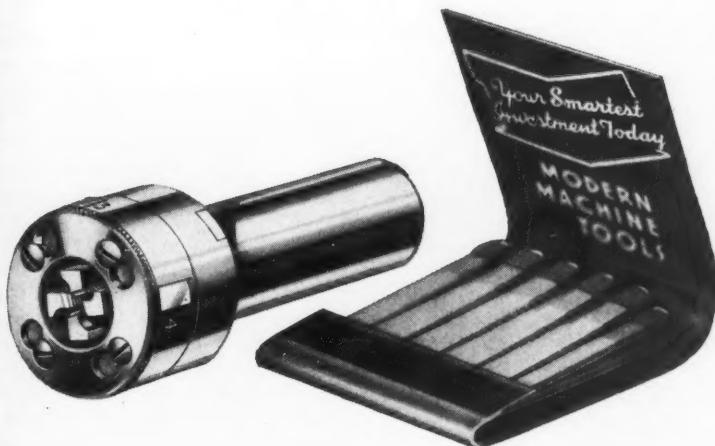
Yet the present trend in regard to arc welding is in that direction. So many codes, tests, inspections, provisions, restrictions, regulations, etc., are being imposed upon the process that the benefits it inherently creates are being seriously affected. Arc welders are severely handicapped, not only by frequent interruptions to permit inspection of work in process but also by having to be qualified over and over again for a type of work for which they have previously been fully accredited.

There is no more justification for this state of affairs in welding than in any other craft or trade. In fact, there is far less justification. Good welders will consistently make good welds, exceeding the physical properties of the metal welded, and they assure the quality of the weld by observing the inside of the joint as it is being made, which is impossible with other less-supervised and less-controlled methods of construction.

All these restrictions are due simply to the misplacing of the emphasis and to misunderstanding of the basic principle of arc welding. The uninitiated automatically focus all their attention on the arc welded joint as the crux of the problem just as though the properly welded joint could accomplish any more than make a strong connection fully as strong as the metal connected. As a matter of fact a good weld—and good welds are consistently made by good welders—develops the full strength of the

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steel welded. This being the case, why look to the weld for problems that never exist in reality? Why should every weld be individually inspected and tested when the welder who made it is fully as competent in his work as the riveter or bolter is in his? And why, above all, should an experienced welder be required to pass test after test to qualify for work he has been tested for previously?

All of these hindrances are poor practice and highly unfair to welders. Given proper electrodes and proper equipment, the experienced welder will invariably make good welds. He knows that his production of sound welds will enable his employer to advance through pronounced improvements and economies in operations. He knows, also, that the benefits which arc welding creates stimulate expansion of his own industry, and by doing so broaden his opportunities for employment and assure his continued earnings. The good welder is a capable conscientious worker upon whom all of the inspection and qualification tests serve only to work hardship. He wants these restrictions removed in order that he may be free to do his work properly and in order that the way may be cleared for further development and expansion of his industry.

As long as these pointless restrictions, regulations, etc., remain, progress with arc welding will be retarded and the immeasurable benefits that it can and will create for industry and society in general will remain unattained.

Maxwell Precision Tool Circular. A circular designated as Form A-5-1940 illustrating and describing the Maxwell Mastur Precision Boring Head, E-Z Set Boring Tool, Recessing Tool, and Precision Grinder Types EX, HE, and D is now being distributed by the F. A. Maxwell Co., 295 Broadway, Bedford, Ohio. Copy free upon request.

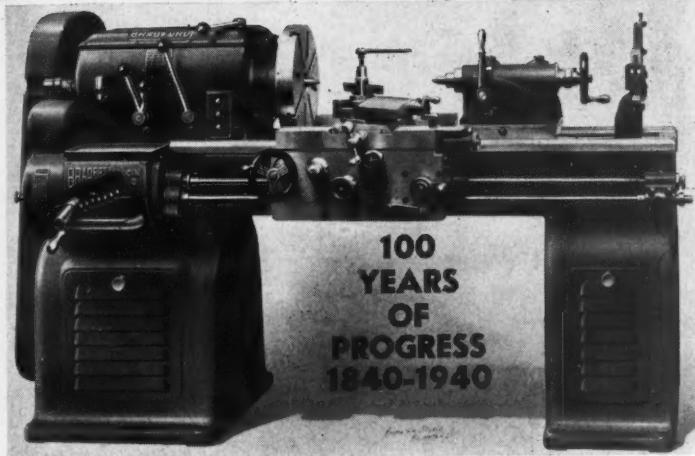
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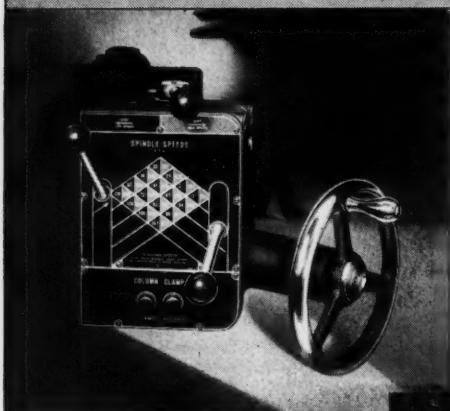
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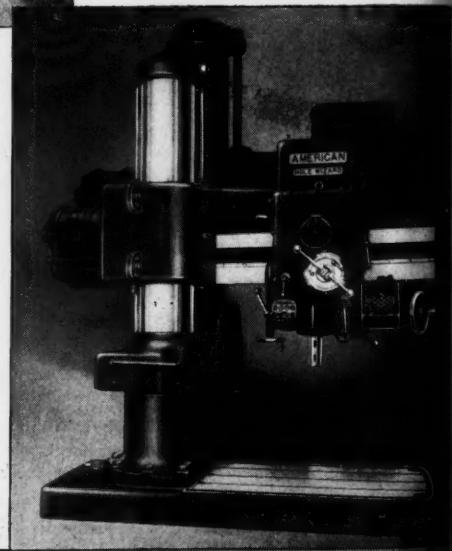
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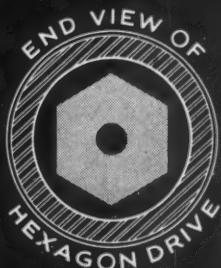
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Microfinish---What It Is and How It Is Used

By LAWRENCE S. MARTZ
Advertising Manager, Micromatic Hone Corporation

THE term "surface finish" may be defined as: "the result of completed labor, as on the surface (exterior face) of an object." It is, therefore, concerned only with the superficial characteristics of the surface. The consensus of recent research indicates, however, that these superficial characteristics are inseparable indications of the attributes of the material supporting the surface. The term "surface quality" is used by many to comprise all the acquired and inherent characteristics not only of the boundary limit, as a surface, but also of the adjacent material which must support the work done by the boundary surface.

Measurement of Surface Finish

The development of instruments to measure and define the characteristics of a boundary surface has, but recently, made possible our first practical knowledge of the functions of surface finish. The Profilograph instrument, designed and completed in 1932 strictly for laboratory use, was the first to permit the height of surface irregularities to be measured in millionths of an inch. Sensitivity of this order may be better appreciated in comparative terms, as follows: one-millionth part of an inch is to one inch, as one inch is to 15.78 miles.

* Presented before the Machinability Group, Cincinnati Chapter, American Society for Metals, and reported exclusively for MODERN MACHINE SHOP.

A Review of the Research by Leading Investigators in the Field of Surface Analysis, a Discussion of the Hone Abrading Process, and a Series of Views Illustrating the Diversification of Work to Which the Hone is Adapted.*

One-millionth part of an inch is 3,000 times finer than a human hair.

The development of the Portable Profilometer in 1936 provided the first use of surface measuring instruments to maintain control of surface finish in production. Its fundamental principles are based upon the use of a tracer support which is arranged with a tiny coil that operates in the field of a permanent magnet. Movements of the tracer are translated into electrical voltages proportional to the velocity of the varying directions of tracer movement. These voltages are amplified and caused to produce direct readings on the visual gauge.

For wide range usage over various types of rough surfaces, the readings provided are in millionths of an inch or microinches. They represent running average of the height of the surface irregularities. In other words, these average readings represent one from one-fourth to one-third the total height of the irregularities, or the equivalent of the stock removal which would be required for clean-up.

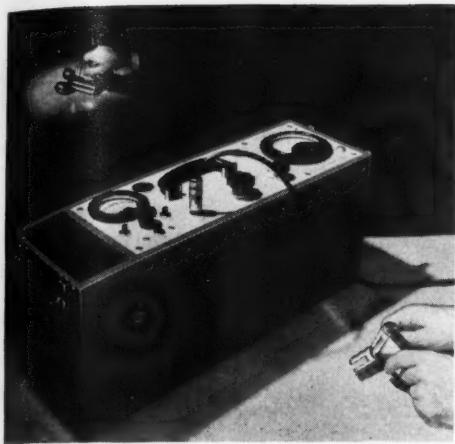


Fig. 1—By the use of the Portable Profilometer shown in this illustration surface irregularities are measured in millionths of an inch.

All of the above instruments use the tracer method of profile measurement.

Extreme bluntness of the irregularities is the typical outstanding feature of thousands of profilograms of various specimens of machined surfaces. The width of a hill or valley is commonly from 10 to 50 times its height.

This fundamental dullness, or bluntness, of *all* surface irregularities is extremely important in relation to study of profile records made by any recording instruments, or in consideration of the maximum degree of smoothness obtainable by any machining process.

The Functions of Improved Surface Quality

Despite unceasing effort toward raising the standard of mechanical accomplishment, much remains unknown about the inter-related attributes of surface finishes under all

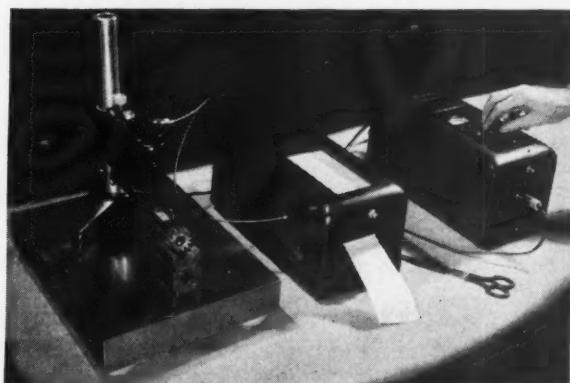


Fig. 2—Surface Analyzer, which records surface irregularities at magnifications up to 100,000 times.

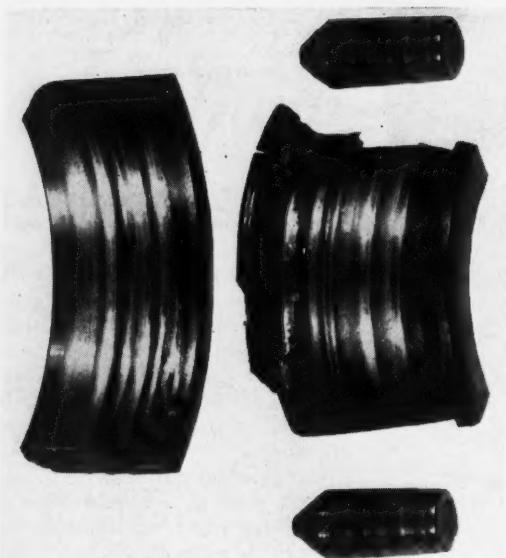


Fig. 3—This illustration shows the failure of a taper roller bearing due to the lack of lubricant, the evidence indicating both sliding and rolling frictional wear in either, or both, the dry or boundary frictional zones.

conditions of generation and use. The attainment of maximum operating efficiency depends entirely upon our understanding of the properties of the material, its use in dimensional design and process, and its use in operation. All are required to obtain the maximum advantage of mechanical balance, metallurgical advancement, and production processing.

Therefore, if accuracy and controlled sizing and fitting may be considered available within desired low tolerances, favorable surface quality and smoothness accuracy may be considered essential for (1) reduction of frictional wear, (2) resistance to corrosion, (3) unbroken, fluid film lubrication, (4) conservation of strength, or prevention of fatigue, (5) low tolerance sizing and fitting of assembled parts, (6) efficient heat transfer, and (7) resistance to percussion, or impaction.

Friction

One of the most important functions of surface quality is to mini-

mize frictional resistance to motion, caused by contact of surface irregularities. The analysis of frictional intensity, and of its reduction, is greatly complicated by lubrication. Assembled operating surfaces commonly may be subject to variable combinations of factors comprising starting friction, sliding or rolling friction, or both, and internal friction in many unsuspected instances. The occurrence and amount of friction

is further subject to operating clearances, rate of motion, the pressure rise during the power cycle, the heat generated, and the grade and viscosity of the lubricant used.

Mr. L. M. Tichvinsky, of Westinghouse Research Laboratories, classifies three kinds of friction occurring in engineering practice, namely: dry, boundary or semi-fluid, and fluid friction.^[1] Boundary friction is defined as including all cases of frictional resistance between solid surfaces which are fully, or partially, separated by a very thin film of fluid, the thickness of which is measured in terms of molecules. It is conceived as being a function of several factors such as: absorption, adhesion, and orientation of the molecules, with absorption playing the predominant role.

The laboratory of Physical Chemistry in Cambridge University has conducted tests which indicate that the value of the coefficient of friction in the boundary region is inde-

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pendent of the velocity and area of contact.^[2] These tests further imply that for some classes of lubricants and surfaces, Amonton's law holds for boundary lubrication, and the coefficient of friction is approximately independent of load. At the same time, it is said that the dependence of the coefficient of friction upon the load for some other class of lubricants and surfaces cannot be correlated according to the viscosity of the lubricant or the polarity of its molecules.

All of which indicates the apparent complexity of determining relative frictional factors.

Frictional Wear

The majority of bearing parts in mechanical assemblies will give better performance if they can be operated in the presence of flooded, or pressure, lubrication. While this is possible in many types of journal bearings, it is not possible in many other important assemblies, such as engine cylinder bores, pumps, compressors, and similar units where wear is of major importance in maintaining operating efficiency.

A majority seem to agree that abrasion, erosion^[3] and corrosion are responsible for the major part of engine cylinder bore wear. Recently, increasing recognition is being given to wear caused by internal friction—called "fretting" corrosion—which occurs most commonly in non-moving, assembled components.

Abrasion is wearing action caused by foreign particles in an oil film. It is caused by sand, chips, dust or dirt which may lodge between bearing surfaces. For example, the highly abrasive action of road dust is a major source of wear in automotive engines.

Erosion is wear caused by metal-to-metal contact of surfaces, or their

irregularities, which break through the oil film. It also results from the removal of the oil film, by any cause. This view shows the failure of taper roller bearing due to lack of lubricant. It shows evidence of both sliding and rolling frictional wear in either, or both, the dry or boundary frictional zones.

Erosion commonly occurs in the presence of any or all of the following conditions: (a) high spots on the surfaces caused by mechanical or thermal distortion, (b) high temperatures, which burn off the oil film, (c) piston rings which do not give uniform wall pressure, or too high wall pressure, (d) high spots on either surface, which create high pressures and dry up sections on the other surface, (e) lubricating oils of low film strength which break down under load, or (f) oil not present at all, being either washed off, or wiped off, as in cold starting and warming up.

These findings have been almost universally confirmed by all investigators, and have been extensively reported in the literature. Much of this work differentiates between initial wear, which occurs during the "wear-in" period of a newly assembled mechanism, and operating wear or "wear-out," which occurs thereafter. Effort toward prevention of this type of wear has led to the conception and development of many new metallurgical alloys and many improved methods of heat treating and hardening.

It is conceded that hardening reduces the rate and amount of wear. Several investigators indicate, however, that this result is due rather to the maintenance of a superior "wear-in" finish over a longer time than to the hardness of the metal itself. An other school of thought projects the theory that wear reduction, particu-

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larly initial or "green run" wear, is best accomplished by impregnated lubrication, such as colloidal graphite, and substantiates the theory with positive test findings.

Fretting corrosion is conceived as occurring due to internal friction, which is activated by vibration,^[4] and which may occur whether or not the assembled components are in motion.

It always occurs at contact surfaces which are by practical standards fixed in relation to each other, such as the press fit of a ball race housing on a shaft, spline fits, shafts and hubs of keyed gears, engine bearings, collets, and so on. The presence of oil does not prevent it, although lubrication modifies the effect. It occurs, however great the difference, in the elastic properties of the metals.

On dismantling such an assembly, the original finished surfaces are found to be corroded and pitted in irregular patches. Usually a quantity of colored oxide debris is to be seen. Form and shape of damaged areas on the fitted parts are generally almost identical. Even force and shrink fits may be subject to this form of wear, as shown by the brownish slime, composed of oxide debris and oil, often seen oozing from the junction of the surfaces.

While oxidation products show that some chemical action accompanies fretting corrosion, it is not corrosive wear as ordinarily understood. This is shown by the fact that no deterioration of the surfaces occurs when the machine concerned is at rest. The primary cause of fretting corrosion is believed to be of a mechanical, rather than a chemical, nature. Vibration appears to be an essential part of the process. On the other hand, recent tests indicate that neither vibration alone, nor alternating stress alone, will cause this type

of wear. There evidently must occur some to-and-fro surface slip. It is now believed that it is the alternating character, rather than the amount, of this slip that governs the occurrence of fretting corrosion.

Interpretation of the theory of mechanical causes involves two classifications of the physical properties of metals:

1—Attrition of the surfaces on a molecular scale, involving uncontrollable, molecular properties, such as elasticity, friction, thermal expansion, and so on, and

2—Mechanical grinding or abrading, involving controllable, structural properties, such as tenacity, hardness, brittleness, and so forth, all of which may be governed by treatment of the metal.

Tests have shown substantially the same amount of fretting corrosion in a range of normal pressures from 2 to 3 tons per square inch. Thus it apparently occurs with little regard to the magnitude of normal pressure. This is evidently not reconcilable with the mechanical abrasion view, but is consistent with the molecular attrition theory. Positive proof of fretting wear resulting from excessively small amounts of slip, within movement of the order from $(5 \times 10^{-4}$ to 5×10^{-5}) 0.05 to 0.005 of a micro-inch, points to the same conclusion. This movement is from four to less than one-half times the atomic dimensions.

Fretting corrosion is said to occur more readily and in greater extent with closer fits and higher degrees of finish of assembled surfaces. The following interesting interpretation is advanced:

Surface elasticity can be explained in a general way as

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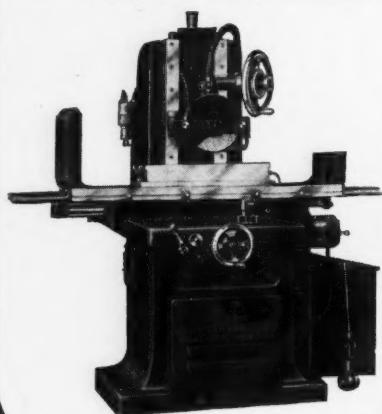
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effect of surface cohesion. When two solids are in contact and are exerting a normal pressure, some proportion of the surface atoms must have approached close enough together to be under mutual repulsion. At this distance there is little doubt that they are within the range of the field of attraction. There are then numerous salient points on the surface where the bodies are linked by atomic bonds.

"If the surfaces are displaced relatively in a tangential direction the chains of bonded atoms are first distorted and then broken. The distortion can be regarded as the source of the surface elasticity. Even a highly finished surface is certainly irregular by comparison with atomic dimensions, and only a fraction of the atoms in the surface take an active part in the cohesion. The elastic compliance of the surface is therefore considerably greater than that of the solid body under shear stress.

"As it has been proved that corrosion is definitely associated with slip, it is reasonable to assume the attrition of the surface to be caused in some way by the severance of cohesion bonds. It seems probable that the detachment of an atom from its parent body does not occur regularly on breaking the atomic bond, but is an exceptional event."

The investigators point out that the above must not be read to exclude the possibility of some special type of fatigue, or similar result progressive deterioration by cyclic straining of the metal as a whole.

"The apparent lack of explanation for many practical examples of corrosion vanishes to a large extent in the light of experience.

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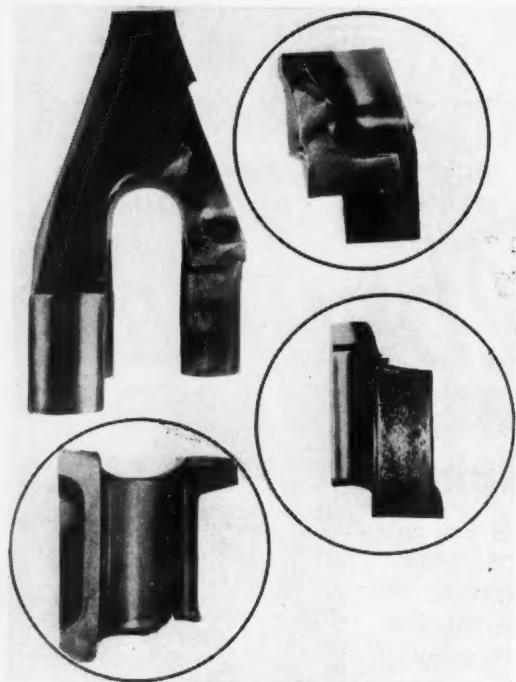


Fig. 4—Illustrated here is a machine part which failed due to fatigue induced by excessive heat and stress, probably caused by a high spot in one or both surfaces.

Prevention or reduction of this type of wear indicates the need for low tolerance dimensional accuracy of form and surface, combined with favorable sizing and fitting of the component parts and a degree of sufficiently smooth surface finish to assure uniform stress distribution and maximum heat transfer. Without such accomplishment of surface finish, accuracy, and low tolerance sizing and fitting, unfavorable wear of some type must surely occur.

As an indication of practical means of preventing fretting corrosion, the following example should be cited:

The manufacturers of aviation engines have practically eliminated this type of wear by facing bearing surfaces with materials which are both physically and chemically resistant to wear. Chrome plating is conventionally used. Care is taken to insure the plating application by providing the smoothest, most accurate surface finish obtainable, both as a base for the plating, and afterwards to establish a uniform thickness of plating. The assembly of knuckle pins in the master connecting rod, which involve the frequent assembly and disassembly of low tolerance clearances, is typical of this practice.

Corrosion

A great deal of research has been reported by the Research Department of the Institution of Automot-

with very small amounts of slip. Components of machines, which by all ordinary standards are fixed beyond the possibility of movement, may be subject to alternating elastic strains which readily give rise to slip at the contact surfaces of the minute order which has been found sufficient to cause corrosion."

The difficulty of eliminating slip of this magnitude is freely admitted by these investigators.

The illustration Fig. 4 presents an example of failure in a machine component furnished by an English customer. Failure is ascribed to fatigue induced by excessive heat and stress concentration spreading from a localized area of attrition. It was probably caused by a high spot on one or both surfaces.

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bile Engineers (England) on the causes of cylinder bore wear.^[5] It cites corrosion as the major cause of wear, comprising oxidation or chemical action of fuels and lubricants on the cylinder walls, condensation, and so on. While this is at variance with similar studies in the United States, it may be entirely true in a country of which it is said that no point in its interior is more than 80 miles from the sea; perhaps not an impossible depth of penetration of the corrosive action of salt sea air.

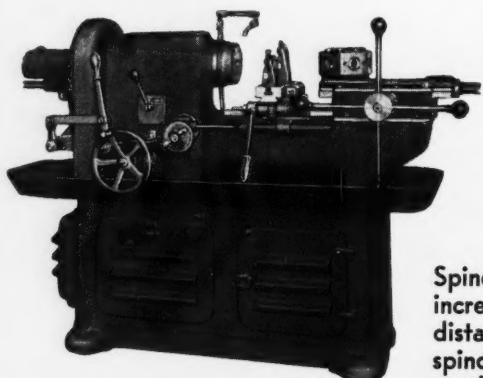
A transplanted American investigator offers the explanation that apparent corrosive cylinder bore wear in England, is, at least partially, due to inefficient lubrication resulting from the English custom of buying oil by brand name, rather than by grade.

Chemical corrosion is evidently considered of relatively secondary im-

portance by American investigators as it receives only minor mention in most of the reports.

On cylinder bore walls, the formation of rust and "etching" is evidence of corrosive action, due to condensation and chemical attack of the by-products of combustion. Condensation occurs during cold starting, and formic, acetic, sulphuric, nitric and carbonic acids are formed during the operation of gasoline and oil type engines. Most engineers, however, choose to believe that the worst chemical corrosion occurs while the engine is cold.

No chemical corrosive action of consequence is believed to occur in conventional types of journal bearings. It is suggested, however, that smoothness of surface finish is important in minimizing the attack of chemical corrosion; for example, a rough surface is more easily etched



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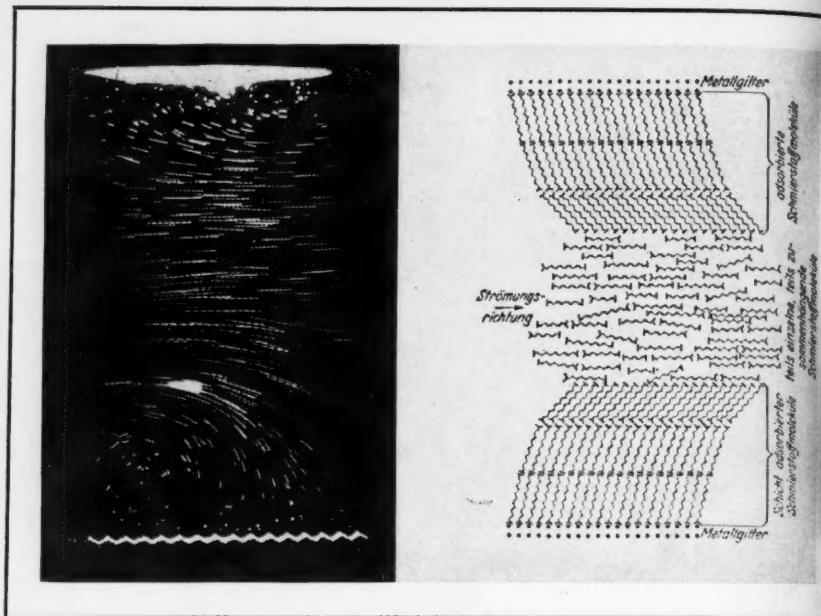


Fig. 5—(Right) Schematic diagram of the supposed arrangement of lubricant between metal surfaces in movement. (Left) Photograph showing characteristics of fluid flow between surfaces of varying degrees of roughness.

by a surface-contacting action than is a smooth surface. This analysis is supported by the fact that stainless steel is not stainless until it is polished.

Lubrication

Practically all investigations in lubrication indicate that the greatest possible refinement of surface finish is required to prevent or minimize metal-to-metal contact of assembled operating surfaces. It is generally accepted that conventionally machined surfaces which have equal or unequal relative roughnesses present ridges or similar irregularities which break the oil film. These irregularities impede the uniform flow of lubricant and maintenance of a favorable wedge film support.

In his brilliant book titled "Technical Fundamentals of Surfaces," Dr.

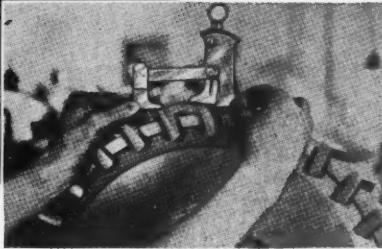
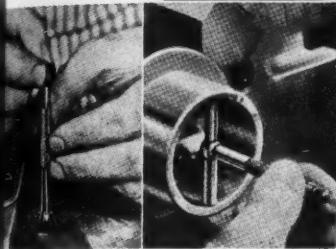
Gustav Schmaltz^[6] furnishes the schematic diagram, shown on the right hand side in Fig. 5, of the supposed arrangement of the lubricant between two metal surfaces in movement. He indicates how the oil molecules are believed to be bound at their ends to metal atoms, and how several layers may stand somewhat on end in permanent contact with the metal, while others are shown distributed at random in the intervening space between two parts of a bearing. The middle, flowing part is apparently many times greater in thickness than the two outer parts. Metal-to-metal contact is obtained when these adhering layers of oil are removed at points of high unit stress.

The view on the left hand side is a photograph, by the light-cross-section method, showing characteristics of fluid flow between surfaces of

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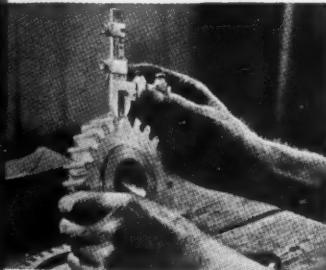
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varying degrees of roughness, which apparently support this theory. Obviously the elimination of "points of high unit stress," comprising too close approach or contact of surface irregularities, is clearly to be desired.

The attainment of a lubricated bearing which will carry extreme loads without permitting erosive contact of the rubbing surfaces is said to rest on three factors (a) Rate of increase of viscosity with pressure, (b) Rate of decrease of viscosity with temperature, and (c) Smoothness of journal and bearing sufficient to permit the initial close approach which occurs before the effect of pressure on viscosity becomes dominant.

Interesting investigations of these phenomena have been reported by Prof. L. J. Bradford and R. S. Wetmiller, of Pennsylvania State College.^[1] Prof. Bradford further explains these studies as follows:

"In the course of some work in testing lubricants, we have had occasion to use a modification of the Timken machine, the principal modification consisting of the substitution of a small brass block, fitted to the journal, for the usual steel block, and the introduction of a thermocouple into this block so that its temperature rise, while in operation, could be measured.

"When we first started work we used the standard journal, consisting of the outer race of a Timken bearing. This had a good ground finish. We found that a sharp rise in temperature, accompanied by a deposit of brass on the journal, occurred at about 6,000 lb. per sq. in. bearing pressure.

"Upon removing the brass with a fine oil stone, we found that the pressure at which the temperature rise and deposition of brass

occurred was some 1,500 lb. per sq. in. higher than at first. Successive stonings caused continued elevations of the critical pressure until a value of some 20,000 lb. per sq. in. was reached.

"We then refinished the surface, using first a medium emery stone, then a razor hone, and finally, three grades of polishing emery paper, a No. 0000 being used last. When the machine was put back into action a very small amount of brass was deposited at about 18,000 lb. per sq. in. This was removed with emery paper No. 0000 without stopping the machine, and it was then found that no deposit of brass and no abrupt temperature rise occurred even though the pressures were carried up to an estimated value of 30,000 lb. per square inch.

"Since that time the machine has operated between 500 and 600 hours under loads varying between 8,000 and 25,000 lb. per sq. in., but there has been no sign of wear on either journal or bearing block. The indications are that the machine is operating under fluid film conditions made possible through the smoothness of the rubbing surfaces, which permits a very close approach without metallic contact."

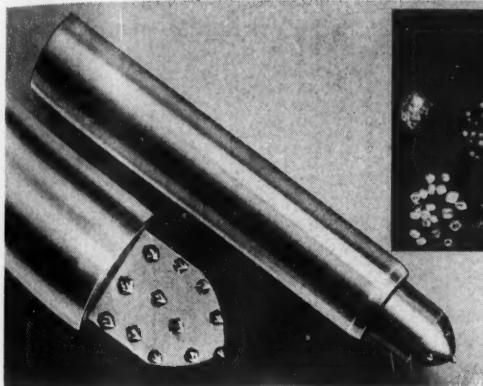
This experience would apparently substantiate the belief that the minimum, unbroken oil film thickness for lubrication for any bearing assembly of given dimensions, loads, rubbing velocity and oil viscosity must be directly proportional to the relative smoothness of the assembled surfaces.

Strength

Data on the effect of surface finish in relation to the strength of the material is relatively meager. Dr. Schmaltz reports experiments^[1] which

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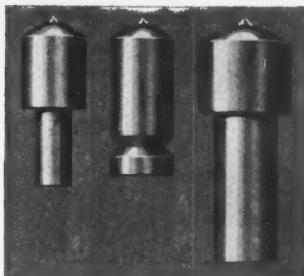
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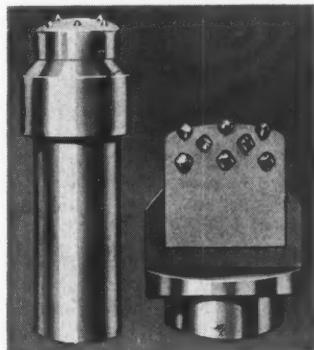
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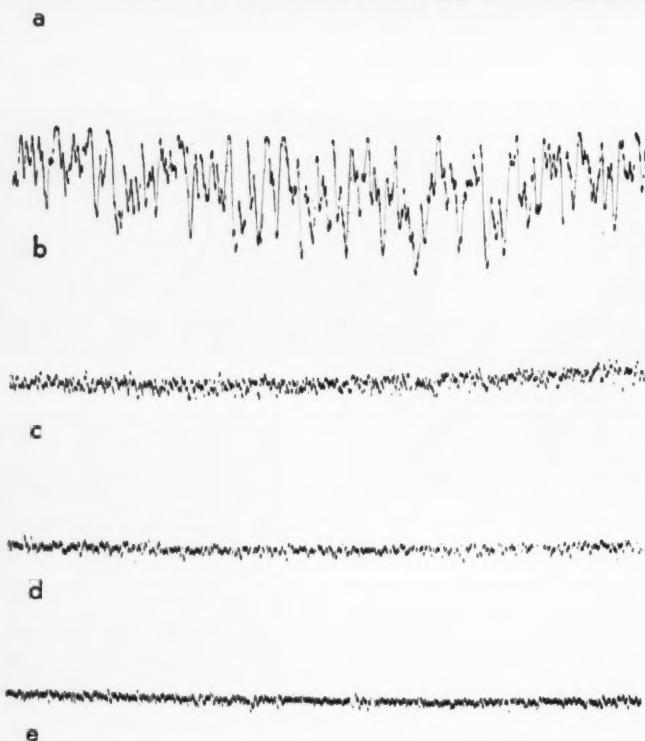


Fig. 6—Profilograph records of piston pin hole and pin finished. Magnification, vertical 2,000X and horizontal 30X. (a) Surface of ground and lapped piston pin hole. (b) Piston pin hole bored with tungsten carbide tool, using fine feed. (c) Piston pin hole microhoned to mirror finish, using 320 grit stones. (d) Piston pin hole microhoned with 50 grit stones. (e) Piston pin hole microhoned with 600 grit stones.

show that the fatigue strength of materials with so-called "ordinary" finish may be as much as 75 per cent less than the same materials with the smoothest obtainable finish. Small tears or cracks in the surface, structural distortion in the adjacent material below the boundary surface, and similar by-products of machining operations, are among the most important factors affecting the strength of metals.

Dr. Stewart Way of the Westinghouse Research Laboratories has recently reported some interesting studies of fatigue failure.^[1] His work comprises investigation of surface fatigue caused by rolling or sliding contact of assembled components.

that the tendency toward pitting failure is minimized on a very smooth surface and accelerated on a rough machined surface.

Precision Sizing and Fitting

A substantial percentage of the efficiency of any assembled mechanism is dependent upon the operating tolerances and their maintenance within a controlled minimum range over a maximum time interval. As previously mentioned, the wear of a given surface is greatly affected by its initial roughness. It has also been definitely determined that any two surfaces of unequal roughness which are initially constructed for a given closeness of fit will not wear in equal amount.

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In the top two profilograms shown in Fig. 6, which were prepared from samples taken from regular automotive production, it is apparent that initial tolerances will not be maintained between the piston pin and the pin hole in operation.

Recent studies indicate the critical relationship of precision sizing and fitting to load bearing lubrication. It is commonly assumed that tolerance of fit can be decreased in direct ratio to the degree of surface smoothness. This conception can be predicated only on faith that the lubricant will permit formation and maintenance of load bearing and molecular film strength in operation. Prof. Bradford, working with high pressure loads, found the required thickness of an oil film, using all of favorable viscosity, to be approximately 32 micro inches, and this result comprised the use of very finely, abraded, smooth surfaces.^[7]

Heat Transfer

Heat transfer is accomplished by conduction, radiation, and convection. Of these, conduction is most affected by surface quality, particularly where assembly simulates laminated layers of material.

Heat transfer induces additional stresses within the material, superimposed on those caused by loading, vibration, and so on. In restrained sections, which inherently retain an original form, it tends to expand the material on the input, or hot side, placing it under compression. The discharge, or cold side, expanding less, is subjected to an equal and opposite extension. When the thermal compression exceeds the elastic limit of the material, the boundary surface material is upset, or distorted relative to its original position in the form. As the metal cools, hair line fissures betray incipient failure, due

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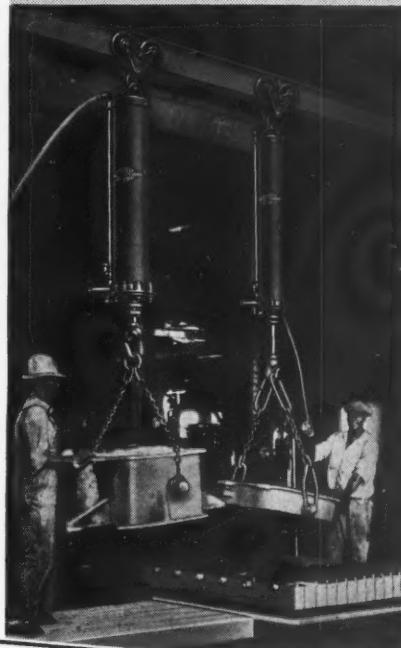
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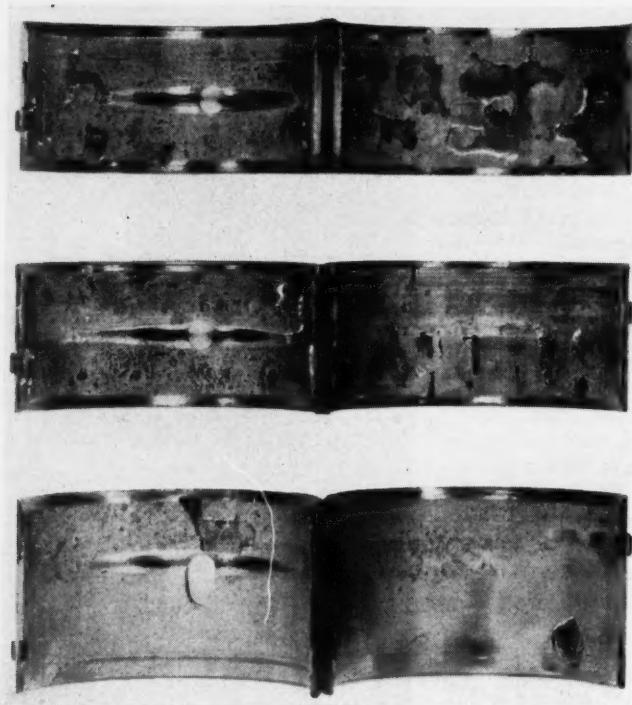


Fig. 7—Illustration of thin-wall, steel back, replaceable-type bearings for connecting rods.

to tension set up as the surface material shrinks, upon the less heated and less strained inner material.^[9]

Such failures may originate at any area where thermal insulation or lubrication is sparse. It is said to be a common occurrence in dry grinding operations where glazed wheels are used by careless machine operators. And—believe it or not—some investigators assert that, for thermal insulation protection and some other purposes, a controlled thickness of amorphous material, commonly called a Beilby layer, is beneficial in some finished machine components.^[10]

The importance of efficient heat transfer cannot better be illustrated than in the assembly of thin wall, steel backed, replaceable type bearings in some connecting rods. The

resultant overloading, stressing and resultant overloading, stressing and disintegration of the bearing material.

Serious study is now being applied to determine the advantages of smooth surface finish on the outside surfaces of dry cylinder sleeves and for the bearing holes in the block into which they are fitted. Acceleration of heat transfer is definitely demanded with higher operating speed in all mechanical assemblies.

It can be obtained by careful design, and by the use of increased bearing contact provided by smooth surface finish.

Condensation and Evaporation

An important factor of heat transfer is the nature of condensation which occurs in some types of

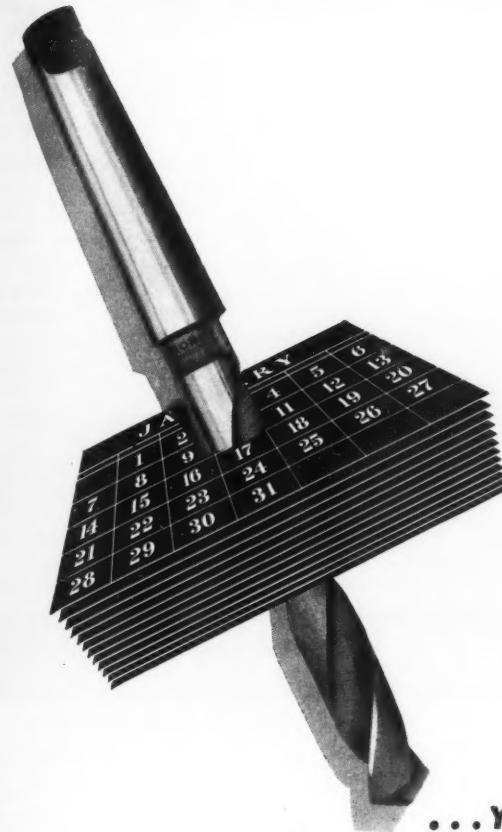
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erating assemblies. If the atoms in the surface boundary molecules possess so-called "free binding forces" that attract and hold foreign particles such as air, moisture, gases, hydrocarbons and oil, then condensation will occur as a smooth or continuous layer. It is logical to regard such a layer as a form of insulation, which retards and reduces heat transfer. On very smooth surfaces, condensation occurs as small droplets and sheet formations are inhibited, thus assisting heat transfer.

Another important characteristic of any surface is the degree to which it is wettable by various materials. While the characteristics of the materials are governing factors, wettability is definitely related to surface smoothness in its practical action. The theory that surface roughnesses or cutting marks, as such, are necessary to act as oil reservoirs in main-

taining an oil film has been definitely exploded by various investigators. This is logical, since process cutting marks do not remain in the surface very long after the initial wearing-in of the parts, nor during the operating life thereafter.^[11]

Recent experiments at Pennsylvania State College indicate the need for more extensive research in this field. These tests show that lacquer is deposited much more rapidly, and in greater quantity, on very smoothly finished pistons than on conventional, ground pistons. No explanation has as yet been found for this phenomenon.^[12]

Percussion or Impaction

Practically all machined surfaces are generated, and functionally operated, under the influence of impact and impulse forces of variable intensities and frequencies. These forces



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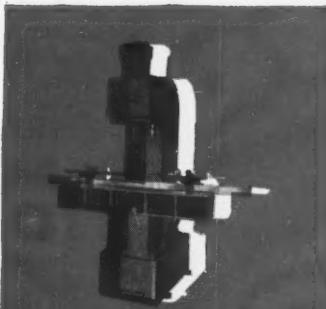
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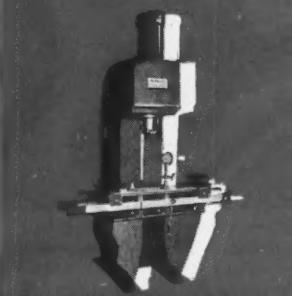
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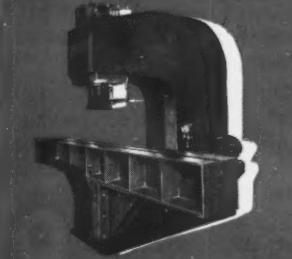
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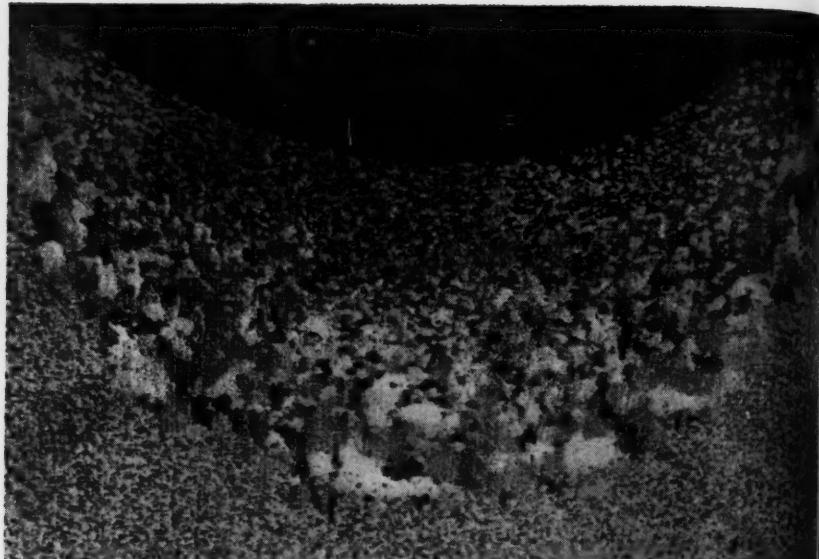


Fig. 8—Photomicrograph of Brinell ball impression, showing microgeometric distortion below boundary surface.

set up intermittent stresses and distortions, both in the boundary surface and to variable depths in the adjacent material, thereby affecting surface quality.

Microgeometric distortion below the boundary surface as produced by an impulse force, is evidenced by the photomicrograph of the impression of a Brinell ball, shown in Fig. 8. It suggests the probability of an equivalent microgeometric, or molecular, distortion of the boundary surface under proportionately lighter force applications.

It has been reported that approximately 85 per cent of the combustion force in an engine cylinder explosion is directly applied at the back of the top compression piston ring. This force causes the ring to strike the cylinder wall with tremendous impact. Conventional distortions of circularity of the ring further increase

localized impaction at various high points around the bore. In consequence, maximum wear in such assemblies will usually be found opposite the application of such impact or impulse forces.

Further experiments have indicated that the extent of this localized wear is somewhat proportional to the roughness of the bore surface and that smooth surface finish tends to reduce the rate of wear at this point. Other preventive measures, comprising various methods of hardening the material, are successful only to a limited degree, indicating that wear is not too directly related to structural hardness.

(The second section of this article will be published in the September issue of this magazine.)

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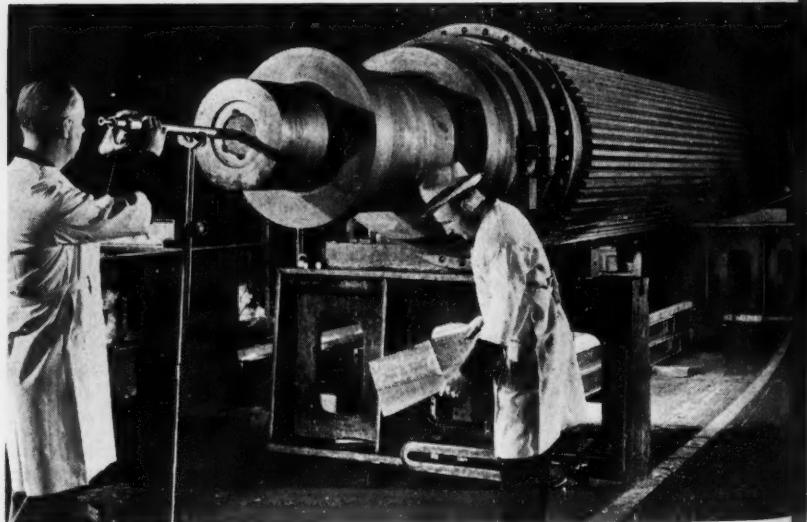
Periscope Becomes Useful Industrial Tool

DURING the first world war dramatic submarine attacks caused intense public interest in the new optical instrument called the periscope. The periscope has an unusual and very desirable quality; it permits the user to take a good look around in places where he can't possibly stick his head. It can usually be lengthened or shortened like a telescope, and can be rotated through full 360 deg. so that one can see completely around the circle.

Such an instrument is just what has been needed for many years for the examination of interiors of im-

portant parts such as the bore of big, important shaft upon which success or failure in use depends hundreds of lives or hundreds of thousands of dollars. It is in the bore that traces of flaws in the metal are found—if there are any—because big ingots cool from the outside to the center, driving imperfections into the core.

The high speed elevators in the Empire State Building and other skyscrapers from New York to San Francisco would instantly stop their power shafts "let go." Thousands of coal miners daily entrust their lives to mine shafts that must not fail, and there are other similar mechanisms in which the safety



At the Allis-Chalmers Mfg. Company where machinery for modern high speed elevators is built, the bore of each power shaft is inspected for imperfections by the use of a periscope with which the inspector can examine, under a bright light, every inch of surface throughout the entire length of the huge shaft.

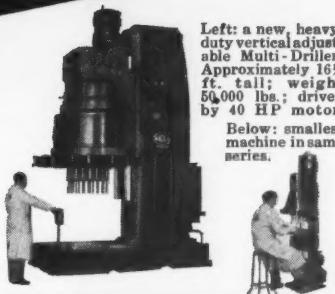
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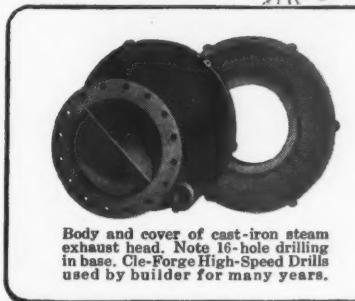
16 "CLE-FORGE"
drill a circle of holes each $1\frac{1}{4}$ "
to $1\frac{3}{8}$ " in a Single Operation
on a new-type Machine



This large new drilling machine has a 36" round head, capable of operating 16 drills simultaneously to produce a circle of holes, each $1\frac{1}{4}$ " to $1\frac{3}{8}$ " diameter. Cle-Forge Drills were installed when the first of these new models was assembled on the erecting floor. Time-tried, reliable Cleveland Drills thus are serving again at the "christening" of modern, large-production drilling equipment.

And, whatever the destination of this machine, one may conservatively expect it will operate "Cleveland" tools on the job.

If you aren't using "Cleveland" Tools now, we will gladly arrange an unbiased, competitive test in your own materials, in your own plant. Consult a "Cleveland" Representative or your present source of supply.



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Equipped with
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Timken Tapered
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You can mill most of your jobs with this amazing precision tool. Streamlined, rugged. Any desired speed instantly available by using *fully-enclosed variable drive*. Rigid pyramid pedestal base. Low in price. High in precision. Power longitudinal feed can be furnished if desired; also draw-in attachment for end mill cutters. Taper—No. 9 Brown & Sharpe. 12" longitudinal feed. 5 1/2" cross feed. Three Tee slots. Motor—1/2 h. p., 1750 r. p. m., 60-cycle. Height, 58" overall. Write for price and Bulletin.



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MACHINES, JIG BORERS & 11" SHAPERS

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human beings depends upon the quality of the shaft.

In the great plants where such parts are manufactured, such as the Allis-Chalmers Mfg. Company, Milwaukee, Wis., the periscope has been adapted for the inspection of these parts. For this work the basic principle of the periscope remains the same. According to Harold Stein, director of research for the Allis-Chalmers Mfg. Company, since Allis-Chalmers first adopted periscope inspection for microscopic flaws in the shafts used in elevator operation, no one shaft has failed in service despite the much higher speeds, temperatures, and pressures that have been developed in the last ten years.

Such periscope tests today are standard practice throughout heavy industry. As a result, entire cities today are protected by periscopes that guarantee unfailing service of the huge steam or hydraulic turbines that supply their power. Battleships and luxury liners alike are protected from disaster by periscopes that ferret out any possible imperfections in the propeller shafts before the shafts are assembled into the ships.

"Eminent Engineering." This is the title of a four-page folder released by Continental Machines, Inc., 1308 Washington Ave., Minneapolis, Minn., describing the many points of precision construction of the DoAll Contour machine manufactured by this firm. Interesting illustrations are included which show clearly such outstanding features as the advanced Speedmaster drive, the upper and lower wheel adjustment, the box table construction of the machine, the super life-time guides which give greatly accuracy in all sawing jobs, and the construction of the completely automatic butt welding unit, which is an integral part of the DoAll machine. The three types of work feeds used on the machine are also described as well as the job selector dial, which is one of the most distinguished features of the DoAll.



When the shortstop spears
a liner—it's Felters Certified
Unisorb that protects the hand!

To baseball club owners good shortstops are worth money and so everything is done that is possible to insure his safety while playing. Certified Felt is used to protect his hand from the impact of a hot liner.

So too, in the machine pictured here, Felters Certified Felt is used to protect not only the machine itself but surrounding machines.

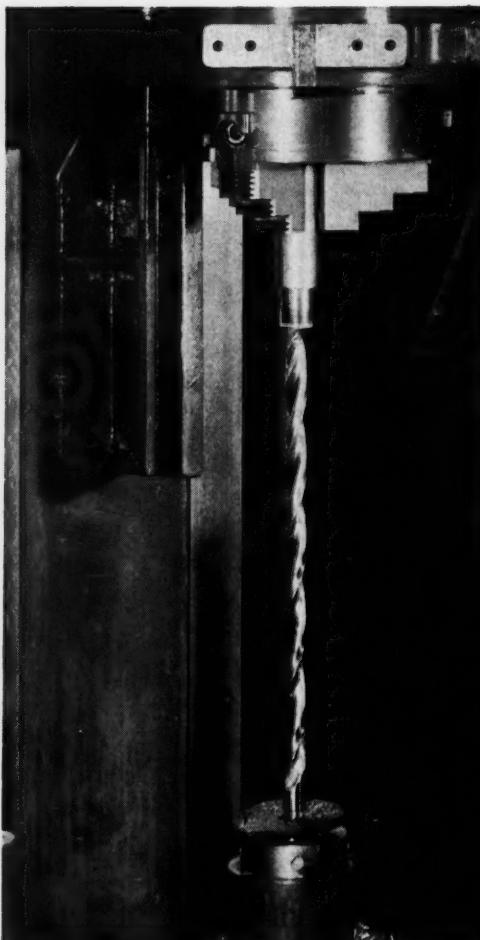
Send for our completely illustrated booklet entitled "Unisorb in the Industrial Plant" which tells of many applications of felt to reduce vibration in industry.



*Courtesy of Wilson
Sporting Goods Co.*

*A thick roll of
felt covers the
outer ridge of
the hand.*

THE FELTERS COMPANY, *Incorporated*
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NATIONAL DRILLS and SAVE PRODUCTION

- Inverted deep hole drilling with aircraft drills having integral pressure cooling passages is a development brought about by new requirements of the Automotive and Aviation Industries.

NATIONAL has again cooperated to make this a successful operation.

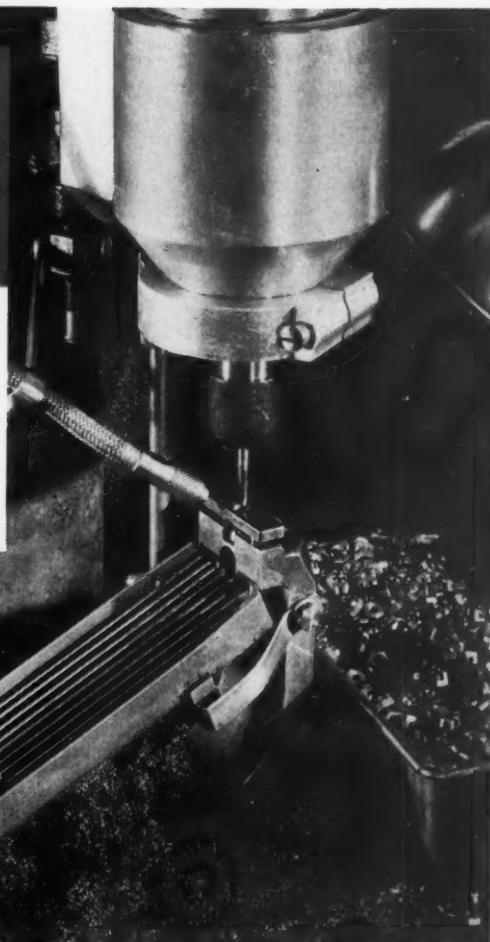
NATIONAL LIBRARY WEEK



NAWINTER and TAPS • • • TIONING AND MONEY

illing with Aircraft nuts, tapped to Class 3 fit, at
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WINTER Taps, engineered for this
pecialized work, are making this
markable performance possible.



WINTER
TAPS • DIES
SCREW PLATES BROTHERS COMPANY
Tool and Die Division of National Twist Drill & Tool Co., Wrentham, Massachusetts



New Plant of *Commercial Centerless Grinding Company* at 6603 Cedar Avenue, Cleveland, Ohio

is excellent example of contract manufacturing shop. Of steel and concrete "daylight" construction, the plant is designed especially for high production work which requires a fine finish and which must be made to close limits of accuracy.

Above is the receiving and shipping department, and below is a view of one side of the machining department, showing a line of Cincinnati Centerless Grinding Machines in operation.



COLD-
DRAWN
SET
SCREWS

ALLEN

FOR UNINTERRUPTED PRODUCTION



PRESSUR-
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CAP
SCREWS

Standing for solidarity

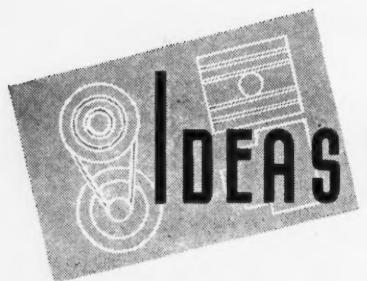
By what basic methods have "Allens" stood solid in the preference of engineers and maintenance men through 30 years?

- (1) By *cold-drawing* of sockets, to increase the density of the steel in the socket-walls;
- (2) By *pressur-forming* of cap screws, to preserve continuous (uncut) steel fibres shaped to the contour of the screw head;
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- (5) By *instrument-testing* at every step, for each physical characteristic, with final hand-and-visual inspection of every screw.

We leave to you the interpretation of these operations in terms of *HOLDING POWER* of the product. So briefly stated, they're merely clues — worth following with our request for *free samples* — leading surely to *SOLIDARITY* in your machine assemblies.

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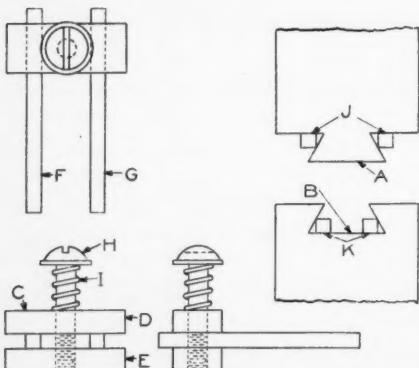


IDEAS FROM READERS

Simple Method of Measuring a Dovetail

By JOHN W. GERDEL

THE construction of a hot metal mould now in use includes two parts one of which has a dovetail as indicated at A in the drawing and the other a dovetail recess as shown at B. Due to the heat to which the



Drawing Illustrating Method of Measuring Dovetail Fits

machine is subjected in use the dovetail recess is constantly changing size and shape, making it necessary to re-machine it frequently in order to keep the angle and depth of the recess constant and assure efficient operation of the machine.

The machining of the dovetail and recess is a comparatively simple operation; the difficulty lay in finding a quick method of measuring the dovetail so that the proper fit could be assured. After trying a variety of measuring methods and tools, the tool shown at C was found to be most suitable.

The dovetail on the block is 0.313 in. high, and the recess in the column is machined 0.313 in. deep, which is intended to provide a close sliding fit when the block and column are assembled. The tool C consists of two blocks D and E, one of which is drilled large enough to take a No. 10/32-thd. screw H and the other is drilled and tapped for the thread. Two $\frac{1}{16}$ -in. tool bits F and G are ground to exactly 0.156 in. square and these ground bits are placed in a parallel position between the blocks D and E where they are held in place by the pressure of a spring I under the head of the screw. The screw is tightened down to a point that will hold the bits firmly while allowing them to be moved between the blocks.

To use, the tool is applied as shown at K. The bits are inserted into the dovetail recess and are spread using a screwdriver, until they are in contact with the sides of the recess. The screw H is tightened and the tool is withdrawn for measurement with a micrometer. The

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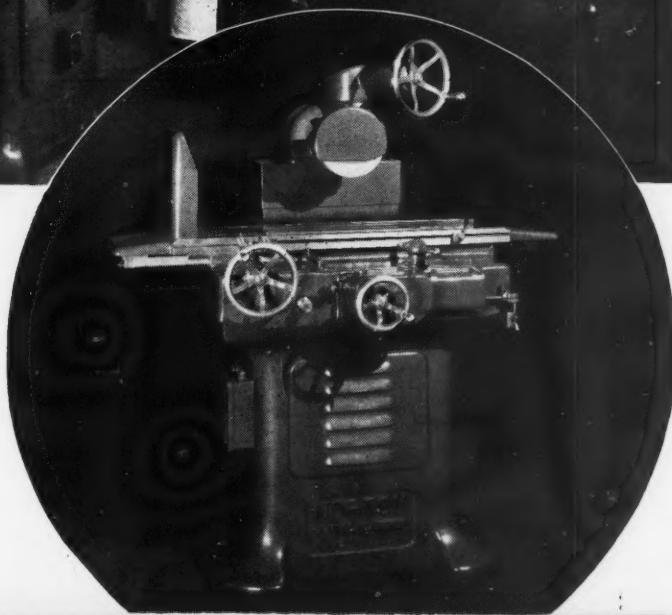
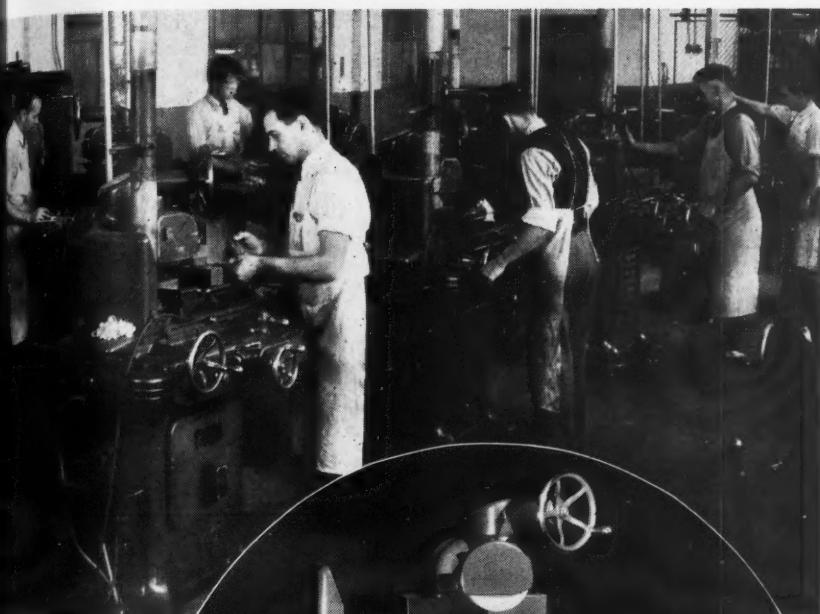
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iron block is then milled and dovetail is measured by placing toolbits as shown at J. The block milled to the dimension obtained K plus 0.312 in. (combined thickness of the two toolbits) plus 0.002 in. for a drive fit.

The method of measuring dovetail fits described here eliminates much figuring and all guesswork.

**Reconditioning Damaged
 Pump Casting**

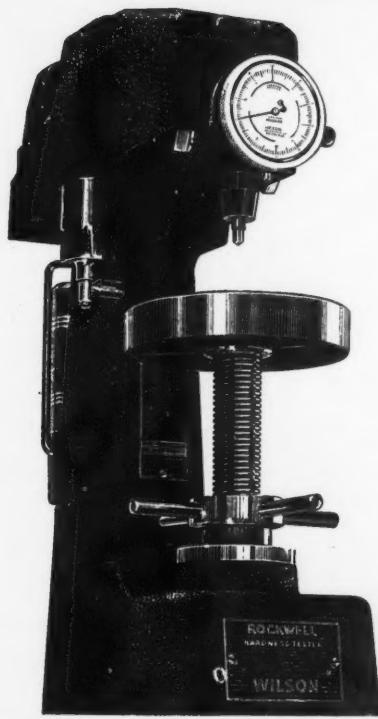
By CHARLES C. LYNDE

WHEN fire swept through a main line crude oil pumping station following the breakage of a discharge line, the job of reconditioning the equipment was undertaken by the pipeline force together with the few trained men that were available from the only machine shop within reach.

The four plunger pumps, tandem duplex, had apparently withstood the tremendous heat successfully and it was decided that the only work necessary on this unit was to run a light finishing grind over the plungers and repack the stuffing boxes. Examination of the ball valves, cage and seats in the pumps showed no impairment, so a trial run was staged. Three and one-half pumps functioned satisfactorily; one side of the fourth unit indicated valve leakage on the suction line.

When the suspected valves and their seats were pulled, they checked up perfectly, but upon replacing them and checking them by the cigarette paper test—laying four narrow strips around the seat and lowering the head onto them—contact was indicated only by two short arcs of each seat. In placing the seats with new ones it was found necessary to correct the trouble, each side indicating lack of contact in the seat.

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WILSON
MECHANICAL INSTRUMENT CO., INC.
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sectors as had their predecessors in the same locations in the casting.

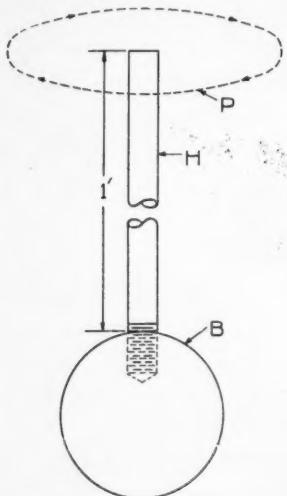
It was decided* that the heat of the fire must have been sufficient to distort the casting, or at least to release strains within it, with the result that the portion carrying the valve seats had contracted across the apertures sufficiently to squeeze the light seat sections out of round and

tated working the ball over frequently in order to permit the use of a greater grinding area.

In an attempt to solve the problem we drilled a hole $23/32$ -in. hole $\frac{1}{8}$ in. deep in the ball, indicated as B in the drawing, and tapped the hole for $\frac{1}{2}$ -in. pipe. Into this hole we threaded a 12-in. long section of pipe H to serve as a handle, inasmuch as the top of the valve seat was $9\frac{1}{2}$ in. below the surface of the casting.

Then, by swinging the upper end of the pipe handle in a circle, indicated at P, and at the same time rotating the ball through a short arc on the seat, the wear of the abrasive was distributed over a zone nearly $\frac{1}{2}$ in. wide around the ball and the seat were quickly brought to a true spherical condition again. The circle P was the largest radius permitted by the casting.

The reworked valves have been in service for more than 9,000 hours without developing leaks, and when valve renewals are finally required it is planned again to utilize a discarded ball as a reseating tool.



Drawing Illustrating Application of Ball for Regrinding Valve Seat

thus cause uneven ball contact on the narrow seat.

As the seats were distorted when in place, it was evident that any reworking of the seat area would have to be done on location, with no reamer available for the task and no means of guiding it had one been available.

Attempting to regrind the seat with one of the balls proved unsatisfactory, due to the fact that the relatively harder seat metal wore a narrow groove in the ball and necessi-

(* The pump manufacturer insisted that this was impossible, but working on this hypothesis cleared up the trouble.)

Efficient, Simply-Operated Rotary Drill Jig

By J. R. WHITTELES

THE drawing illustrates the design of a drill jig that was developed for drilling eight holes in the periphery of a workpiece used in the construction of a drum. The jig consists of a cast iron holder, A, through which extends a reamed hole that is a running fit on the stud D. The holder is integral with a substantial base and supports a top plate provided with a milled slot in which a steel plate, B, carrying the drill bushing C, is anchored by means of two screws and a dial pin. Two holes,



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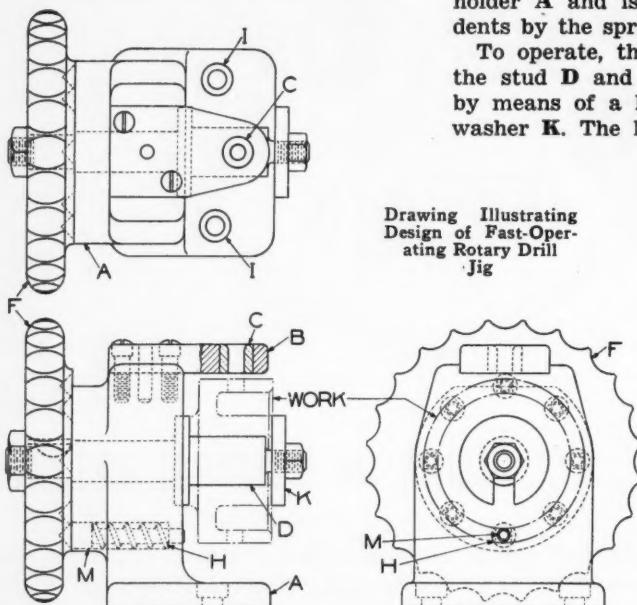
And now, seeing but dimly through the haze that clouds all business prophecy, but realizing our own deep responsibility, Republic, vital to peacetime prosperity, pledges its every effort to help keep America the way we know it and love it—to keep America safe for Americans—through steel, first line of national defense. Republic Steel Corporation, Cleveland, O.

T. M. Lindley
CHAIRMAN OF THE BOARD

R. Myron
PRESIDENT

are drilled in the base of the holder for the bolts with which the holder is bolted to the drill press table.

In order to assure squareness of



Drawing Illustrating
Design of Fast-Oper-
ating Rotary Drill
Jig

the stud **D** with the base, the stud is made with a flange which fits into a counterbore in the holder **A**. A handwheel **F** is keyed to the stud at one end and is held in place by means of a hexagon nut. Finger-grips are provided in the rim of the handwheel, as shown. Eight indents spaced

45 deg. apart are machined in the side of the wheel to receive the point of the plunger **M**. The plunger is located in a counterbored hole in the holder **A** and is forced into the indents by the spring **H**.

To operate, the work is placed on the stud **D** and clamped in position by means of a hexagon nut and washer **K**. The handwheel **F** is then

rotated until the point of the plunger **M** drops into one of the indents on the side of the wheel. The work is now in position for the drilling of one hole. Following the drilling the handwheel is rotated, causing the point of the plunger to be forced out of its present indent and into the following one. The

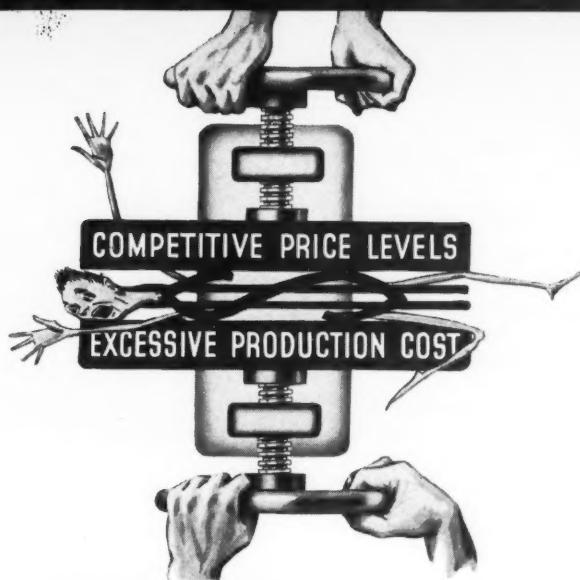
drilling is repeated and the routine followed until the piece is finished.

A time-saving feature of the jig consists in that the operator indexes the work with one hand while operating the drill press feed lever with the other. Though of simple design this jig will be found very fast.



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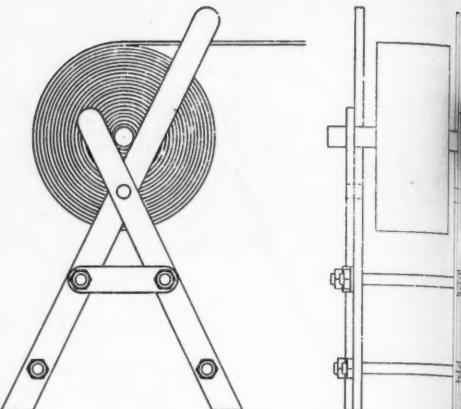
STEP DOWN COSTS with a LeBLOND STEP UP PROFITS

Simple Stand for Coiled Stock

By CHAS. H. WILLEY

ILLUSTRATED in the drawing is a stand of simple construction, designed to facilitate the handling of coiled stock for feeding to presses. The stand is patterned after the well-known saw horse, but two of the upright pieces are left long enough to serve as guides for the stock as it comes from the coil.

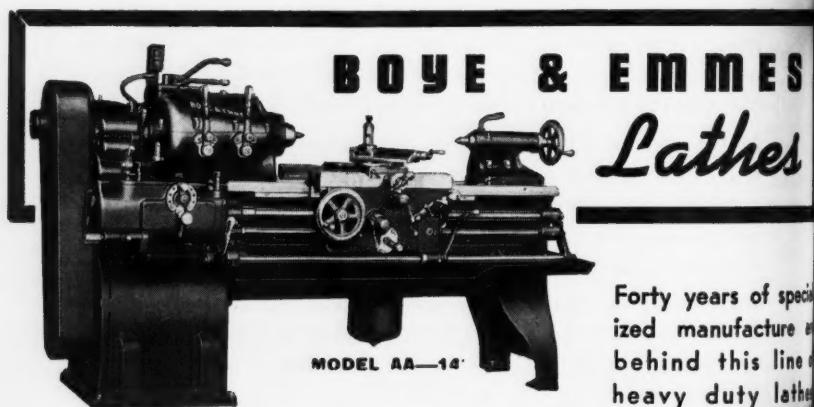
The stand consists essentially of two long and two short steel or wood members, bolted together with bolts of sufficient length to allow for the maximum width of stock. By using pipe sleeves over the bolts, the nuts can be drawn tight on the



Drawing of Simple Stand for Coiled Stock

bolts with the pipe section serving as spacers, making for rigid construction.

In use, the coiled stock is suspended on a shaft inserted through the



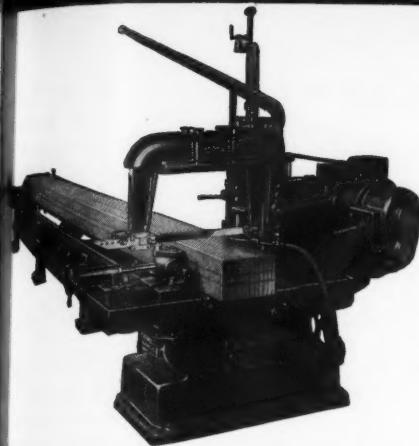
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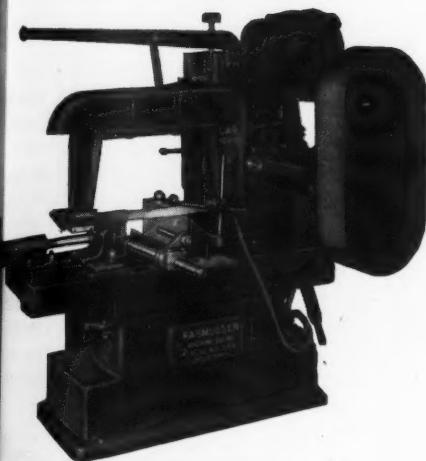
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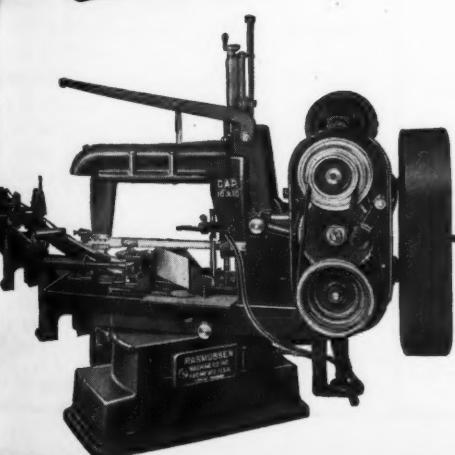
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"Saw More" 4-Speed Gear Box Transmission

With 12 foot automatic bar feed.
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MANUFACTURED IN
2 Sizes — 6" x 6" and 10" x 10".
Either with or without automatic
bar feed.



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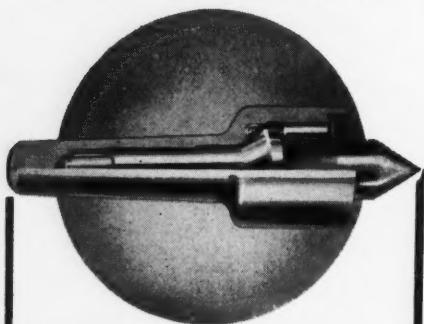
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2. Special oil seal retains lubricant and resists foreign matter.
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hole in the center of the coil, with the shaft cradled in the V formed by the crossed pieces as shown in the drawing. When not in use as a stock stand, the stand can be used to support armatures or similar parts.

Safety Item for the Month

By W. F. SCHAPHORST

SOME twenty years ago among the jobs that fell to my lot was one of helping an experimental engineer while he babbitted some bearings. The engineer was pouring the metal and I was holding the forms while at the same time watching his movements closely. Suddenly there was an explosion and some of the hot metal was blown into my eyes. Fortunately for me, Nature was kind and in time grew a new layer of skin over my eye, removing all traces and effects of the nasty burn.

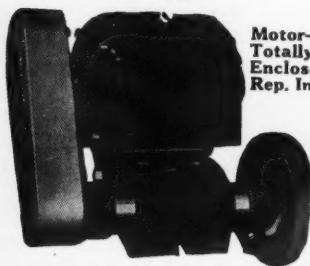
Many others have not been so lucky. The moral is: before pouring hot metal into anything, whether vessel, mould, form, or shape, be sure that there is no water or moisture present in the receptacle.

In the case cited above, enough moisture was present in the mould to generate steam, which it did suddenly upon contact with the molten metal. It was the steam that blew the metal into my eye. To ensure safety, it is a good rule to heat the mould or vessel before pouring the molten metal, thus driving out all moisture.

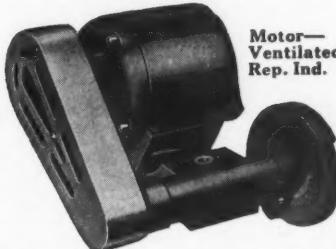
Crucible Drill Rod Folder. A six-page folder containing tabulations of sizes, analyses, and list prices of the "full range" of carbon tool steel drill rods manufactured by the Crucible Steel Co. of America, 405 Lexington Ave., New York, N. Y., has been published by the firm. Copy free upon request.



TYPE HE $\frac{1}{2}$ H. P.

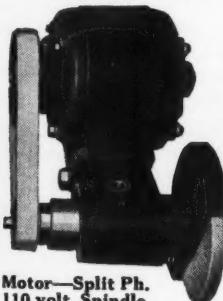


TYPE EX $\frac{1}{2}$ H. P.



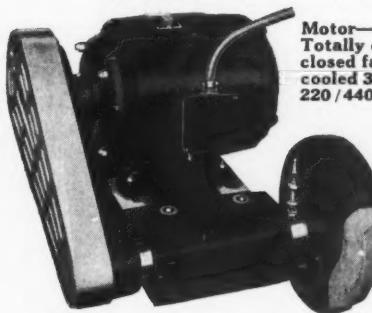
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Over the Editor's Desk

Craftsmen and Sons

IT IS traditional that, when a young man asks his father for advice regarding a career, the father advises his son to enter any business or profession except the one that the father has followed—regardless of the fact that he, himself, may have been quite successful at it. So it is encouraging to find, in one corporation, a number of fathers who love the work they are doing to such an extent that they have brought their sons up to follow after them.

We have just been looking at the "Over 30 Years" page of a beautiful brochure recently put out by the Heald Machine Company. Among the men who have been with this firm for more than 30 years and whose pictures are presented on the page are nine who have been photographed with their sons—sons who are also employees of Heald. Presented here are the general superintendent and his son, the assistant superintendent and his son, three of the department foremen and their sons, and other 30-year men with their sons.

Here are men who have found satisfaction in doing creative work; who have learned to appreciate the beauty of a fine mechanism through developing the skill to produce the parts of which it is made; who have learned to appreciate the fine points of design through years of seeing designs translated into finished mechanical units; who have learned to know the song of a machine that is operating properly and to detect instantly the

discordant note that tells when something is wrong; who know how to stone a tool so that it will take off half-thousandth; who know how to balance an inside caliper so that it will "feel" a couple of tenths; who can tell by a glance at the chip whether or not the drill is ground true.

Here are men who know how to tell when the correct amount of clearance has been allowed for a running fit; who know what speeds and feeds can safely be used on materials of different compositions and of varying degrees of hardness. And in developing this skill these men developed something in their own soul that is not found in buying and selling or in doing the thousand and one jobs which, while perhaps necessary, leave the world no richer than before.

The Heald Machine Company is to be congratulated on having in its organization these nine men—and probably many more who have not reached the 30-year class—who find much satisfaction in the work they are doing and in the firm with which they are associated that they are glad to have their sons working by their sides. The satisfaction that is to be found in fine craftsmanship is not easily understood by those who have never had the opportunity to develop such skill, but if more young men could be made to realize the knowledge of a craft is the best foundation upon which to build a career, many of our so-called labor and unemployment problems would be much closer to solution.

Swings into any desired position —and stays put

The accompanying photographs suggest the amazing flexibility of the Dazor Floating Lamp by illustrating a few of the countless positions obtainable. It may be raised, lowered, pushed, pulled, swung completely around by a mere finger's touch — and stays rigid at the exact angle placed, **WITHOUT ADJUSTMENT OR LOCKING**, the arms being scientifically counter-balanced by a spring.

Dazor Floating Lamps mean correct localized lighting, with no glare, no eyestrain. They soon pay for themselves in greater efficiency.

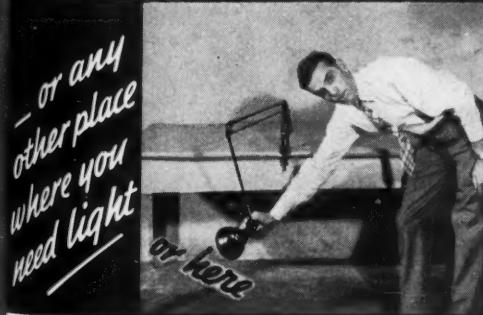
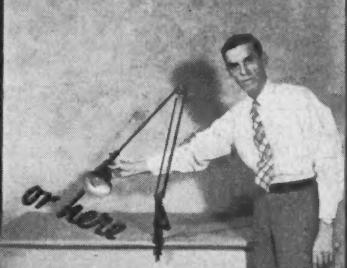
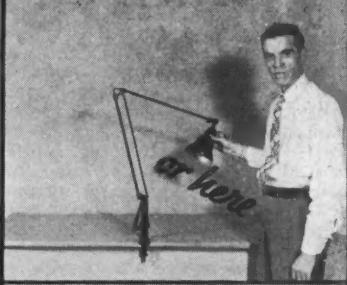
Five types of bases available for clamping or screwing to lathes, drills, presses, shapers, milling machines, benches, drafting boards, desks, walls, business-machine stands. Also portable pedestal type.

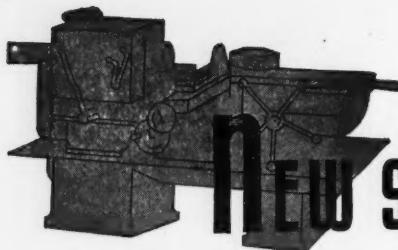
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DAZOR MANUFACTURING CORP.
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Dazor Floating Lamps

Fluorescent and Incandescent





NEW SHOP EQUIPMENT

Hanchett No. 700 U.K. Traveling Wheel Grinder

Especially adapted for grinding edges of armor plates, a grinder of the traveling wheel type has been brought out by Hanchett Manufacturing Company, Big Rapids, Mich. On this grinder the work remains stationary and the grinding wheel head is mounted on a carriage which feeds back and forth past the work to be ground. The machine has capacity for grinding plates up to 20 in. thick by 10 ft. wide by 45 ft. long. The illustration Fig. 1 shows the machine

set up for grinding on an experimental piece of work.

The grinding wheel, which can be seen in Fig. 2, is of the segmental type and is 48-in. diameter. Each abrasive block is 8 in. high with a 4-in. grinding face. The grinding wheel spindle, which is 8-in. diameter, is mounted on Timken tapered bearings and is driven through sheaves and V-belts from a 125 h.p. motor. The grinding wheel head has hand, power and automatic cross feeds, and can be adjusted from vertical to an angle of 30 degrees.

The grinding wheel carriage travels on one V and one flat way, each $6\frac{1}{2}$ in. wide, and is actuated by means of a driven bull gear which engages with a rack anchored to the machine bed. This feed mechanism is powered by a 15 h.p. reversing motor with controls for providing variable speeds. The ways are lubricated by a forced feed system which is powered by a $\frac{1}{4}$ h.p. motor, and the ways and rack are protected by covers.

The machine is intended for wet grinding and a 1 h.p. centrifugal coolant pump is attached to the bracket shown at the left of the carriage in Fig. 1. This coolant pump delivers coolant both to the wheel and to the work during grinding. Electrical current is



Fig. 1—Hanchett No. 700 U.K. Traveling Wheel Grinder

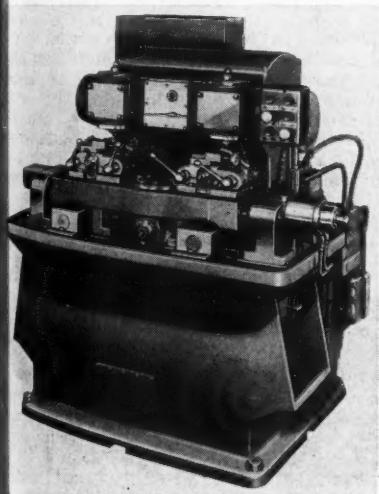
Fig. 2—View of Hanchett Traveling Wheel Grinder Showing Segmental Grinding Wheel and Controls

supplied to the various units on the machine by means of buss bars and brushes completely enclosed in cast iron guards attached to the rear of the bed. The operator rides the carriage and has all controls within his reach. The complete machine, without work table, weighs approximately 15,000 pounds.

Red Ring Profiling Machine

National Broach & Machine Company, 5600 St. Jean, Detroit, Mich., has brought out a profiling machine which is said to be very rapid, entirely automatic, and to hold finished work to a tolerance limit of 0.002 in. It is said that no mechanical skill is needed to operate this machine and because it is entirely automatic, one operator can handle more than one machine.

The operation performed by the Red Ring Profiling Machine is said to be



Red Ring Profiling Machine



strictly a profiling operation and not to be confused with three-dimensional duplicating. Profiling by the Red Ring method is restricted to the milling of profiles, internal or external, flat or undercut, on parts having a profile pattern not larger than $6 \times 8 \times 2$ in. thick where the cut is $\frac{1}{8}$ in. deep or less on a face $\frac{3}{4}$ in. wide or less.

The profiling mechanism is actuated by a closed differential hydraulic circuit which assures entire freedom from chatter, the maximum responsiveness to directional changes of the guide pin, and close limits of accuracy. The hydraulic circuit includes a hydraulic pump which actuates the pistons by drawing a measured amount of fluid from one side and transferring it to the other. A second pump maintains and regulates the amount of pressure in the system.

The work table, which carries two work fixtures in order to double the rate of production, moves laterally. The spindle head carries two spindles, one for each work station, and moves at a right angle to the direction of table movement. These two principal movements are both reversible and each is actuated by its own hydraulic cylinder. When the spindle head cylinder is working under feeding pressure, the table cylinder is working under holding pressure and vice versa. The change from feeding pressure to holding pressure is obtained by dogs which control limit switches.

In operation, a master pattern is

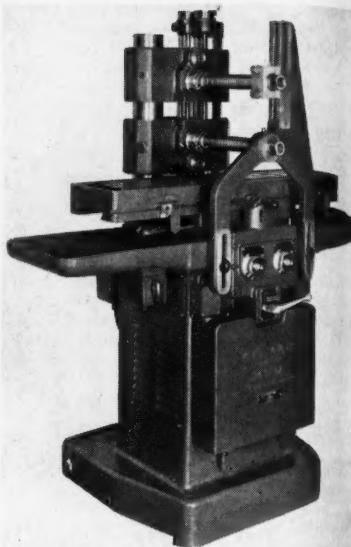
mounted rigidly on the work table and a guide pin, integral with the spindle head, extends upward under the table to contact the periphery of the master cam. Locating this mechanism beneath the table avoids the possibility of errors caused by chips and dirt. When the machine is in motion, the guide pin traces the periphery of the master pattern, the motion of the pin being guided by maintaining the cam and guide pin in contact, which is accomplished by means of changes from feeding pressure to holding pressure as required by the shape of the pattern.

Cutter spindles are individually motor driven and vertical adjustment is provided on the spindles to allow for slight variations in tool adjustment. The tapered guide pin can be adjusted vertically to compensate for cutter wear. Forced feed lubrication is provided to all bearings and slides.

Kent-Owens Double Spindle Milling Machine

Kent-Owens Machine Company, Toledo, Ohio, has introduced a line of milling machines equipped with double spindles, especially suited for splitting bushings, milling slots in pistons and other similar operations. They can be used on a wide variety of parts where there are two or more surfaces which can be milled to advantage by using two cutters mounted on different spindles.

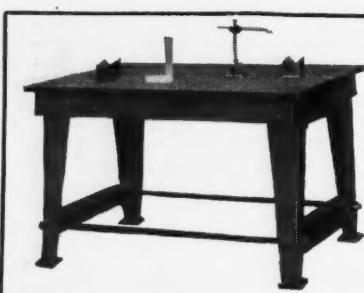
The illustration shows double spindles mounted on a Kent-Owens No. 1-14 Hydraulic Milling Machine. This machine has 14-in. table travel and a 32 by 9-in. table. Two panel dials control the feed rate of the table from $\frac{1}{2}$ to 80 in. per min., the dial at the left being used for



Kent-Owens Double-Spindle Milling Machine

the fine feeds, while that at the right for coarse feeds.

The spindles are adjustable vertically and independently of each other by means of screws having micrometer dials. The center distance between the two spindles is $4\frac{3}{4}$ in. minimum and 12 in. maximum. The center of the lower spindle can be brought to within 1 in. of the table surface minimum and the center of the upper spindle can be raised to a maximum of 12 in. from the table surface. Each of the spindles can be adjustable horizontally and independently of the other by as much as 1 in. and can be accurately positioned by means of micrometer dials.



MILWAUKEE Surface Plate

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Nicholson, producing more than 3000 file shapes, sizes and cuts, is the world's largest and most completely equipped file manufacturer. When you choose Nicholson or Black Diamond files you get *quality* files—uniform files—correct files for the job . . . plus the privilege of calling on file experts whenever Progress hands you a new filing problem.

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ALUMINUM
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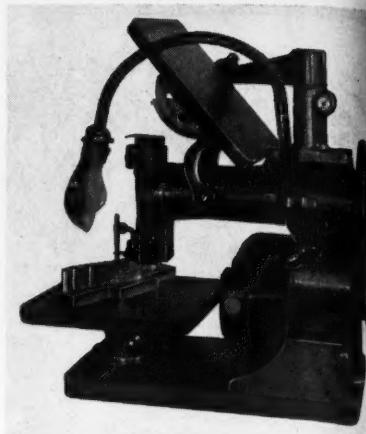
FOR EVERY PURPOSE

The spindle heads are supported on two ground cylindrical steel posts. The drive is from a standard foot mounted ball bearing motor mounted at the rear. This drive is extremely simple and provides a balanced design insuring against chatter or vibration.

The machine is furnished complete with spindle drive motor, hydraulic pump motor, and all hydraulic equipment and electrical equipment, and a single spindle speed selected to suit the particular job. Though the illustration shows the double spindle arrangement applied to a Kent-Owens No. 1-14 Machine, it can also be mounted on the Nos. 1-M and 1-8 Machines.

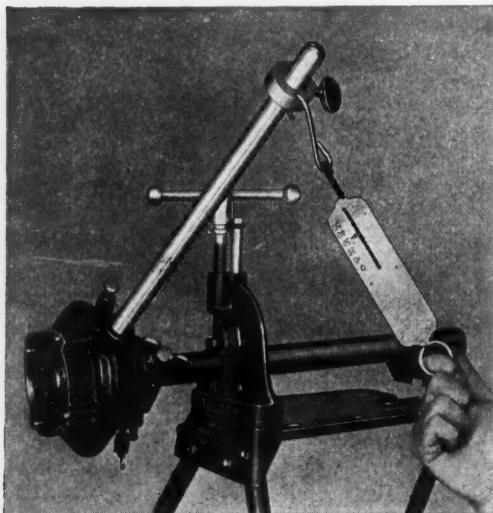
Duplex Die and Punch Filing Machine

The Duplex Die and Punch Filing Machine illustrated herewith is now being marketed by Marburg Brothers, Inc., 90 West St., New York, N. Y. When used as a die filing machine, the table can be tilted to any compound angle. The stroke is fully adjustable from 0 to $1\frac{1}{2}$ in. and the file is fully supported



Duplex Die and Punch Filing Machine

over the entire stroke. When used for punch filing, the table can be tilted 1 deg. in either direction. The stroke is fully adjustable to suit the punch flange. The file operates from the top and will stop if it should touch an



THE FINEST OF 1" TO 2" THREADERS

THE TOLEDO PIPE THREADING MACHINE CO.
TOLEDO, OHIO

New York Office, 72 Lafayette St.

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This simple "torque-test" proves a "TOLEDO" SIMPACT requires less effort to operate.

Deep throated high speed steel dies that can be resharpened many times—and it requires but one set to thread all sizes from 1" to 2". Oil pockets drip oil on dies and pipe as thread is being cut. Handle is 24" long. Adjustable rear guide. Black crackle finish. Be assured of easy operation, long life and good threads—insist on a "TOLEDO" SIMPACT.

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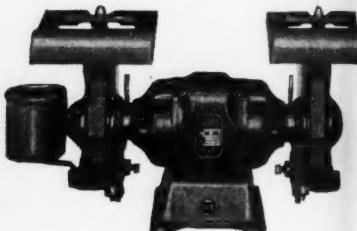
SAGINAW, MICH. New York City
TAPES—RULES—PRECISION TOOLS



obstruction such as an irregular heel. Both tables are accurately ground and are 10 in. square to accommodate the average run of dies and punches. The construction is such that the work is in full view of the operator at all times. The crank drive with a range from 0 to 1 1/2-in. stroke can be used as a permanent drive, or it can be set as a friction drive incorporating a safe clutch, automatically reducing the stroke or eliminating it altogether should the file strike an obstruction. Regular machine files can be used on this machine. The net weight is 136 lb. Standard equipment includes a 1/4 h.p., 110 volt, single phase 60 cycle motor located inside the frame with a two-step pulley for two speeds through a V-belt, flexible light in a ball socket, and complete set of wrenches.

Baldor No. 724 Ball Bearing Grinder

The Baldor Electric Company, 411 Duncan Ave., St. Louis, Mo., has announced the development of a 7-in. deluxe model ball bearing grinder, designated as the No. 724. The grinder is powered by a 1/2 h.p., 3,400 r.p.m. motor.



Baldor No. 724 Ball Bearing Grinder

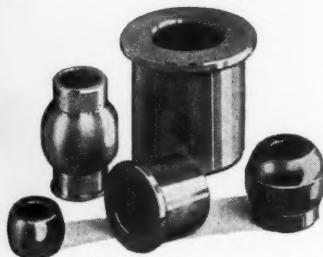
and is equipped with 7 x 1-in. Alox wheels.

The main feature of the grinder is the shatterproof glass eye shields. Each shield accommodates a tubular lamp which throws a ray of light on either side and in front of the wheel without creating annoying shadows. Other features include spark breakers, a waste pot attached to the grinder, and a wheel rest which is adjustable to and from the wheel, up and down, and which may be tilted for angle grinding.

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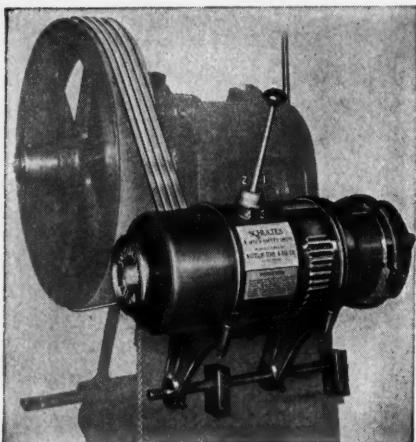
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Features:

For punch presses, lathes, shapers, milling machines, drill presses, etc. One lever syncromesh shift controls 4 speeds.

Instant reversibility with all 4 speeds
Adapted to V-belt, flat-belt, chain or direct drive.

Hand wheel permits rotation of machine spindle for set-up work with complete safety.

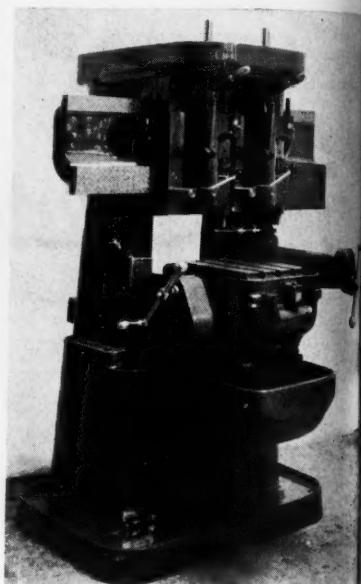
Cradle adjustment permits the unit to be revolved to any desired position.. placing gear shift lever where most convenient.

Write for illustrated folder

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430 BELLEVUE AVE. DETROIT, MICH.

Morey No. 12M High Speed Vertical Profiler and Milling Machine

In the announcement of the No. 12M High Speed Profiler and Milling Machine which was published page 126 of the July issue of MODERN MACHINE SHOP, the wrong illustration was used. The machine shown is



Morey No. 12M High Speed Vertical Profiler and Milling Machine

is the correct machine. This machine is built by Morey Machinery Co., 410 Broome St., New York, N. Y.

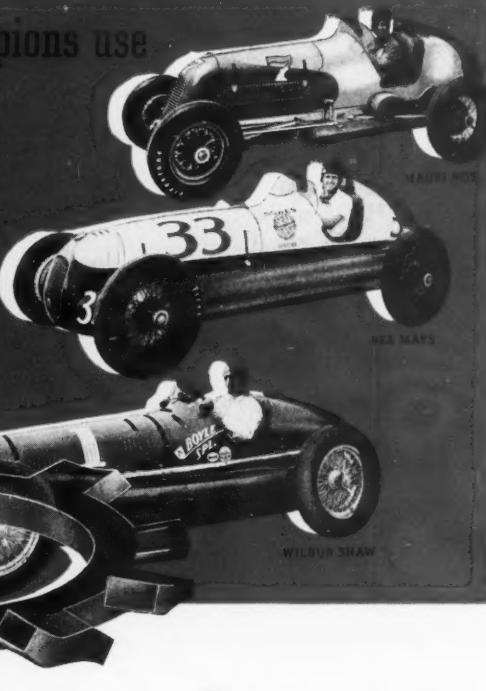
The Morey No. 12M High Speed Vertical Profiler and Milling Machine is designed for the economical manufacture of small parts requiring accurate interchangeability. The standard machine has two spindles, as shown, but the machine can be supplied with a single spindle upon special order.

The maximum distance from the spindle to the table is 12 in., this distance can be increased by moving a filler block from between base and table housings. The spindles are driven independently by vertical motors through a four-step V-belt drive.

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EVERLOCK WASHERS



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Wilbur Shaw

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500 mile race know danger. Loose parts...and accidents lurk at every turn of swiftly moving wheels. To prevent bolts, nuts, and screws from loosening EVERLOCK WASHERS were used on all winning cars of the Indianapolis races in the past five years. Automobile racers have learned through experience that EVERLOCK WASHERS help materially in safeguarding their lives. In Wilbur Shaw's own words, "I played safe. The EVERLOCK WASHERS used in my car held perfectly". Need more be said? There's an EVERLOCK WASHER for every purpose. The styles and sizes are many. You'll find EVERLOCK WASHERS fill your requirements, too.

THOMPSON-BREMER & CO.
640 WEST HUBBARD STREET • CHICAGO

The spindles are regularly equipped with high speed, preloaded, anti-friction, super precision, permanently lubricated bearings for spindle speeds up to 2,000 r.p.m., although the machines can be equipped with high speed anti-friction bearings which are designed by the maker for maximum speeds of 10,000 r.p.m. All shafts in the control movements are mounted on ball bearings and provision is made for taking up backlash in gears.

The working surface of the table is 12 $\frac{1}{4}$ x 15 $\frac{1}{4}$ in. and the longitudinal table travel is 23 in. Distance from table top to spindle end, minimum, 4 in.; maximum, 8 to 12 in., depending on 4-in. filler blocks. Distance between uprights, 18 $\frac{1}{2}$ in. Depth of machine, 48 in. Width, 64 $\frac{1}{4}$ in. Spindle speeds with 1,200 r.p.m. motor, 327, 480, 660, and 900 r.p.m. With 1,800 r.p.m. motor, 490, 720, 990, 1,350 r.p.m. With 3,600 r.p.m. motor, 980, 1,440, 1,980, 2,700 r.p.m.

Grob Model NS-18 Band Saw

Grob Brothers, Grafton, Wis., have developed the Grob Model NS-18 Band Saw shown in the illustration. The

machine is built for the tool room as well as for the general machine shop. The machine consists of a one-piece welded steel frame, reinforced to ensure rigidity. Swinging doors provide quick access for changing saw blades. A cast iron table of box section construction, heavily ribbed, 24 x 24 in. in size, is tiltable four ways. Besides being clamped in the conventional manner, it is locked with a table stabilizer which makes the table sufficiently rigid for the heaviest job. A Grob Butt Welder with built-in tool grinder is mounted into the frame in the most convenient position for the operator to join metal blades for internal cutting.

Both upper and lower saw guides are adjustable in height. The lower saw guide can be brought flush with the table surface or above the table surface for special jobs. For cutting sheet metal the guide is adjusted to be just slightly above the table surface, thus eliminating shattering and possible breakage of saw teeth. Both upper and lower saw guide holders are locked in position by an improved single lever quick-acting clamp. A built-in drawer and cabinet provide ample space for storing tools, saw blades, and so on.



MODEL 160: (above) Heat range 15 to 160 amps., 20 steps, 1/16" to 5/32" rods. Voltage 110/220, 60 cycle, A. C. For continuous use.

MODEL 250: Heat range 15 to 250 amps., 24 steps, 1/16" to 1/4" rods. Voltage 220/440, 60 cycle, A. C. For continuous use.

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It's like FINDING MONEY to operate ERGOLYTE A. C. Arc Welders

Put Ergolyte A. C. Arc Welders to work on both old or new jobs, for production or maintenance, and see how they speed up production, improve finished work, lower costs, and increase profits.

FAST—more inches of welding per hour.

EASY TO OPERATE—by beginners and old timers. Ful-Vue control panel; quick heat-change "jack"; and on-off current switch.

LOW OPERATING COST—only a few pennies an hour at full capacity.

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PROVEN PERFORMANCE—tested for over 3 years.

COMPLETE ACCESSORIES—ready to operate.

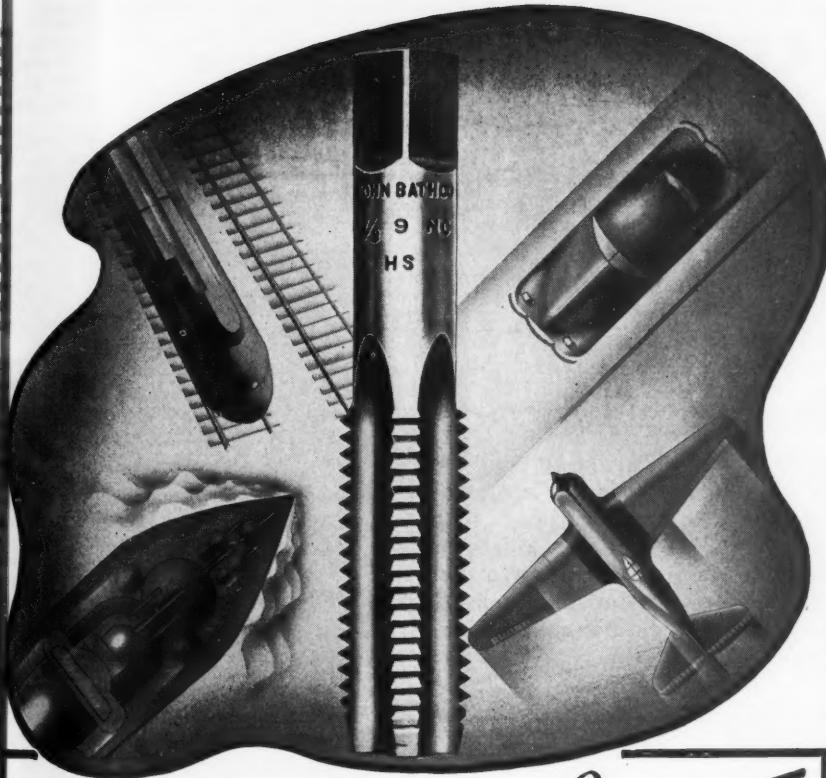
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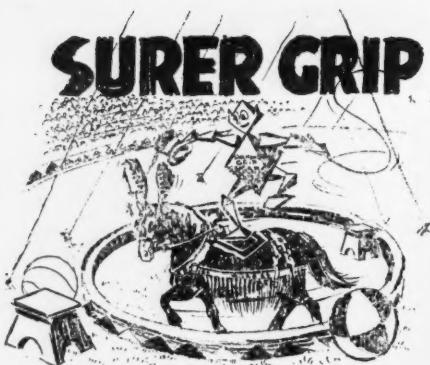


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whether your horse-power is in the circus ring or in the motor of a screw machine equipped with Sutton DIAMOND-GRIP Collets... Diamond grip is a surer grip that requires less tension to eliminate slippage. And that means reduction of spoilage.

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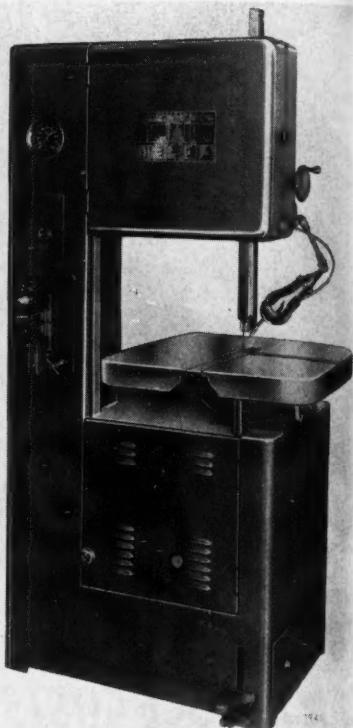
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A 1 h.p. motor is used in connection with a silent, practically frictionless V-belt drive. All pulleys are mounted on ball bearings. Ten speeds are provided, from 50 to more than 2,000 ft. per minute to the saw blade.

A chart for the selection of saw blades as to width, number of teeth, and speed is mounted on the machine. Thus, the



Grob Model NS-18 Band Saw

operator knowing the smallest curve to be cut, the thickness and kind of material, can immediately determine what saw blades to use. The saw band tension wheel and indicator are on the upper right of the machine within convenient reach of the operator.

The machine is not too large to handle small, intricate jobs with blades as small as $\frac{1}{8}$ x 0.025 in. and, on the other hand, with the large throat of 18 in. and distance from the table to the upper column of 12 in., it will cut extra

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thus, the

**NEW, LONG LENGTH
STRAIGHT SHANK
HIGH SPEED DRILLS
9" Cutting Flute
12" Long
IN STOCK**



Size	Length Overall Inches	Length of Flute Inches	Our Net Price Each
3/16	12	9	\$1.50
7/32	12	9	1.60
1/4	12	9	1.75
9/32	12	9	1.85
5/16	12	9	2.00
11/32	12	9	2.25
3/8	12	9	2.50
13/32	12	9	2.75
7/16	12	9	3.00
1/2	12	9	3.25

Orders for 12 or more assorted sizes will take 10% discount from above prices.

Money Refunded If Not Satisfied



Send for Our New 1940 Catalogue

VICTOR MACHINERY EXCHANGE, INC.

251 Centre Street

New York, N. Y.

heavy jobs with ease and speed when using saw blades up to 1 in. wide.

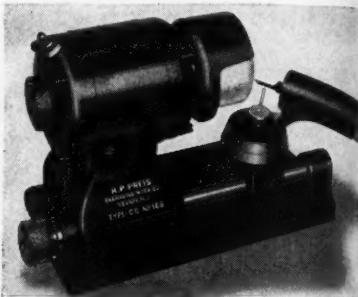
Optional features of the machine include automatic hydraulic checked table feed, light attachment, air blower, circular cutting attachment, magnifying glass, and tachometer. The net weight of the machine is approximately 1,000 lb.; floor space required, 33 x 41 inches.

Preis Grinder for Single-Lip Engraving and Routing Cutters

A compact bench-type grinder for accurate sharpening of single-lip engraving and routing cutters has been announced by H. P. Preis Engraving Machine Company, 157 Summit St., Newark, N. J. The machine, designated as the Panto Model CG, will handle tapered shank cutters and straight shank cutters up to $\frac{3}{4}$ -in. diameter.

The grinding wheel is of the cup type, $2\frac{1}{4}$ in. in diameter, and is attached directly to the shaft of a totally enclosed ball bearing universal motor operating at 8,500 r.p.m. The cutter-hold-

ing spindle is mounted in a swivel arm which is graduated for quick setting of any cutting angle or taper desired. Stop notches are provided for grinding



Preis Grinder for Single-Lip Engraving and Routing Cutters

three-cornered or four-cornered cutters. While the cutter is rotated with the operator's right hand, the carriage is controlled by the left hand. The feed is controlled by a feed screw actuated with the left hand.

A solid spindle is furnished for use



STANDARD 2 PIN



SPECIAL DIE SET

QUICK SERVICE FOR DIE MAKERS FROM COAST TO COAST

Three assembly and warehouse plants: Bridgeport, Conn.; Detroit, Mich., and Cleveland, Ohio. Large facilities at Detroit for manufacturing and shipping all catalogued and special die sets. Prompt shipment throughout the Middle West by motor truck. Better service for users in Ohio, Western Pennsylvania and West Virginia. **PRODUCTO DIE SETS** are assembled and shipped from Die Supply Co., 1390 East 30th St., Cleveland, Ohio.

PRODUCTO DIE SETS

Pacific Coast users can now obtain **PRODUCTO DIE SETS** from stock at: Joseph C. Fletcher, 1415 Folsom St., San Francisco, Calif., and Frey Industrial Supply Co., 323 Santa Fe Ave., Los Angeles, Calif.

Ask for Catalog No. 8

THE PRODUCTO MACHINE CO.
990 Housatonic Ave. Bridgeport, Conn.
3017 Medbury Avenue Detroit, Michigan
MANUFACTURERS AND DISTRIBUTORS OF **PRODUCTO DIE SETS**, DIE MAKERS' ACCESSORIES, DICKERMAN AUTOMATIC PRESS FEEDS

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setting
desired
grinding

THE GRINDING OF A DRILL

is a slow, tedious and costly job in many plants, where hand methods prevail or where obsolete machines are in use.

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The Oliver Drill grinder is a modern machine, designed to automatically grind drills with uniform, variable clearance and variable point angles and long life points that **OUT PERFORM.** (Automatic Features available only on the Oliver.)

* * *

Actual savings by the Oliver method, in drills, labor, power, increased performance and reduced scrap will soon pay the small cost of a machine.

Send for details on this and other Oliver "Tool Conditioners": Twist Drill Grinders, Face Mill Grinders, Tool and Cutter Grinders, Tap Grinders, Point Thinners, Die Making Machines.



Cut illustrates the new 510 Oliver automatic twist drill pointer—for drills $\frac{1}{4}$ to 3"—Variable point angles—Variable clearances.

OLIVER INSTRUMENT COMPANY
1430 EAST MAUMEE STREET .. ADRIAN, MICHIGAN

August, 1940

MODERN MACHINE SHOP

145

of tapered shank cutters only, and a collet spindle is available for those using both tapered shank and straight shank types.

Mechanical grinding of cutters is said automatically to ensure correctness of angle, accurate centering of the point, and uniform sharpening, resulting in time saving, extension of the life of the cutters, and improvement in the quality of the work. This equipment makes these advantages available to shops whose sharpening requirements do not justify the installation of the larger and more expensive grinders.

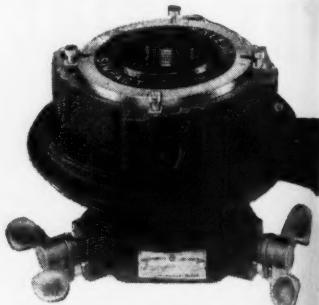
Dimensions of the grinders are 9 1/2 in. long, 4 1/2 in. wide, and 6 in. high. Weight, 13 pounds.

"Toledo" Simpact Self-Contained Ratchet Threader

The Toledo Threading Machine Co., Toledo, Ohio, announces a self-contained 1 to 2-in. ratchet threader to be known as the "Toledo" Simpact. It is claimed that the tool will cut perfect tapered threads with minimum effort.

The Simpact uses high speed steel

dies which can be quickly changed one size to another by pushing the selector buttons and slipping the



"Toledo" Simpact Self-Contained Ratchet Threader

into the proper steps. The die is backed by tapered steps so that semi-long tapered threads are assured. Three-jaw rear gripping device is employed. It is equipped with three bevelled chuck jaws, graduated posts, and large wing-head thread screws, thus assuring, easy, positive

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Will Appreciate

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RUBBER DRUM SANDING



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"HEY JOE, LEND ME 200 AMPS FOR FIVE MINUTES"

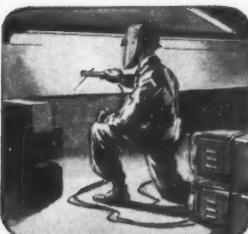
• What a welding service! — Any current you want. Each unit has a capacity from 15 amps. to 200 amps. — and you can combine the capacities of two or more machines.



• It's done in a jiffy, by connecting this simple paralleling arrangement. This is not possible on any other machine.



• Finished with special high amperage job operator unhooks parallel circuit, loosens "multiple shifter." It takes only a few seconds —



• With single control for two machines at once, operator gets 300 amps. by setting "multiple shifter" at 150, half the total amperage desired.



• — and both operators now resume regular work with separate services of 200 amps. each. No need here for special amperage machines.

P&H-HANSEN SQUARE FRAME WELDERS

You can take peak loads in stride with this flexible welding service. Stacked one above the other, machines can be connected in parallel to meet every need for high amperage. The rest of the time, operators have individual services of from 200 down to 15 amps. to handle the general run of work. Small, but amazingly efficient, this new Square Frame Welder gives you unequalled performance, new ease of operation, new thriftiness of current. In this modern service, all the famous P&H-Hansen features are retained—and improved—to bring you a new era in low-cost welding. Why not get all the facts? Ask us to send Bulletin W-28.

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Your Smootharc Welding Electrodes come to you "factory fresh," sealed in air-tight containers, protected against moisture. You can store them for long periods without deterioration. You save dry-house expense—gain the advantage of quantity prices. Smootharc electrodes are available for every requirement in welding steels and alloys, as well as for hard servicing, resistance to impact, etc. Write for literature.



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"DOALL is the OUTSTANDING MACHINE in our Shop"



Service Die & Engineering Company, Detroit, made this complete die on the DoAll. It is used to make the glove compartment on the instrument panel of a well-known automobile.

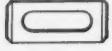
DIE— $2\frac{1}{4}$ " thick mild steel was sawed out in $1\frac{3}{4}$ hours.



PAD— $1\frac{1}{2}$ " thick air die steel, sawed out in $2\frac{1}{2}$ hours. 25 pounds of steel were saved.



STRIPPER— $\frac{3}{4}$ " cold roll, sawed out in 45 minutes.



KNOCKOUT— $\frac{3}{4}$ " cold roll, sawed out in 30 minutes.



CAM DRIVES on the DoAll table— $2\frac{1}{2}$ " oil hardened tool steel, sawed out in 20 minutes each. Later they were welded to base.



Two DoAll Contour Machines and one DoAll Band Filer are kept busy 24 hours a day in this modern plant.

The DoAll is a moderately priced, rugged machine tool that replaces shaping, milling and lathe work with enormous savings of time, labor and metal.

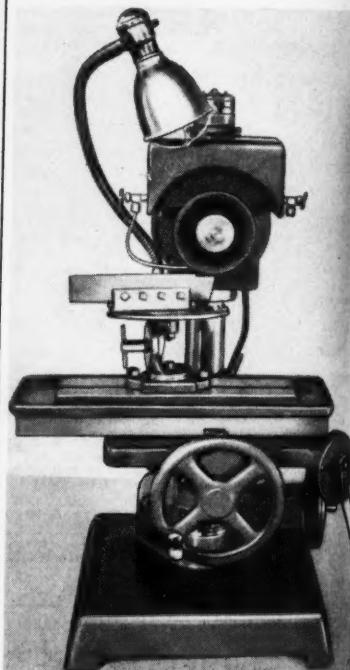
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METAL WORKING HANDBOOK

CONTINENTAL MACHINES, INC.
1306 S. Washington Ave., Minneapolis, Minn.

accurate centering of the tool on pipe. The 24-in. tubular steel base is strong and light, and the tool is to be lighter in weight than other contained models, yet no light weight castings are used in its construction. The dies are deep throated and may be resharpened many times.

K-O Chip Breaker Grinder

A special machine designed for grinding carbide chip breakers, shown here with, has been brought out by K-



K-O Chip Breaker Grinder

Lee & Son Co., Aberdeen, S. D. This machine is equipped with a universal fixture which is of simple design, rigid and is quickly set to produce a chip breaker tool exactly to specification.

The machine as shown is complete with a universal fixture and vise for holding tools up to $1\frac{1}{4}$ in. wide. It is powered by a 110 volt, 60 cycle, single phase, a.c. motor with reversing switch.

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Grinder
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UNBRAKO DIFFERENCE

... THE DIFFERENCE BETWEEN UNCERTAIN SCREW
PERFORMANCE AND UNQUESTIONABLE ASSURANCE
OF UNFAILING STRENGTH AND UNIFORM ACCURACY

KNURLED



SOCKET HEAD CAP SCREWS

Certain exclusive design features distinguish "Unbrako" Screw Products . . . features which qualify "Unbrakos" for service where no ordinary screw suffices. On "Unbrako" Pat'd. Pend'g. cap screws, it's the knurled "Better-Grip" heads that make the difference. For the knurling provides a non-slip surface for mechanic's fingers or pliers and permits making adjustments in many places where it is impossible to get a wrench—hence speeds up production.

Added to these outstanding advantages are the use of last-minute alloys, controlled heat treating, cold-forging, precision machining to micrometric specifications, thorough inspection of the finished product—basic factors that insure the strength and uniformity of each "Unbrako" Screw. Full details are worth your immediate investigation—write today!



SELF-LOCKING



SET SCREWS

Fig. 1645
Patented

with the Knurled points

Once set up with no more than average effort, "Unbrako" Self-Lockers just grab hold and grip . . . they *stay set* despite constant and severe vibration! Yet the knurled points which automatically lock the screws into place offer no extra resistance when setting up, adjusting or removing, and "Unbrakos" can be used any number of times with equal effectiveness.

On your equipment, "Unbrako" Self-Lockers will eliminate the cost of frequent maintenance check-ups and prevent the accidents and breakdowns caused when ordinary set screws fail to hold. A note on your letterhead brings full information—no obligation at all.

STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA.

BOX 556

BRANCHES

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and 10 ft. of extension cord to plug into outlet. The machine is equipped with a resinoid bond diamond wheel especially designed for this work. The wheel is 100 grit and can be supplied either 4 or 6-in. diameter and from $\frac{1}{8}$ to $\frac{3}{8}$ in. thick, all with $\frac{5}{8}$ -in. hole. The depth of the diamond section is $\frac{1}{8}$ inch.

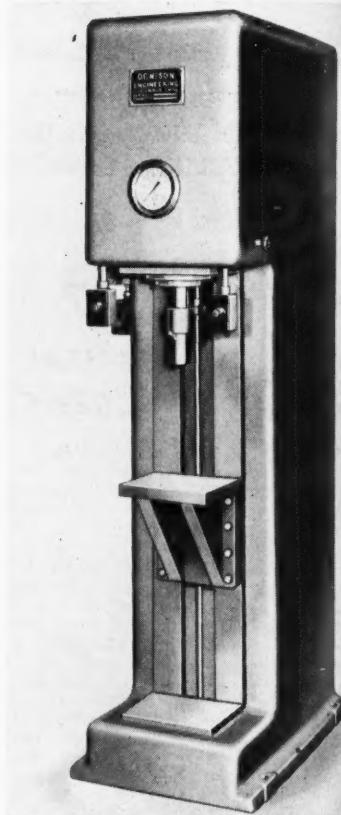
An outstanding feature of this equipment is the simplicity of the fixture. By following instructions any angle can be obtained on the side or back and any amount of rake can be obtained.

Denison Type DLKC2 Hydraulic Press

Denison Engineering Company, 103 W. Chestnut St., Columbus, Ohio, has brought out a hydraulic press designed to meet the same requirements for pressing operations as previous machines built by this firm, but arranged especially to facilitate rapid change of tools or fixtures. With a finished lower platen and finished throat surface, the press can quickly be re-tooled with a variety of bolsters, supports, or special tools and fixtures. Thus the press is

particularly efficient for use where wide variety of small lot or production pressing operations are involved.

The control valve with its operating mechanism, motors and pump are located in the center section. The ram and cylinder assembly is located in the



Denison Type DLKC2 Hydraulic Press

THE
NEW
HEAVY
DUTY
PUNCH
No.
129

Capacity,
10 ton.

Stroke Depth,
12".

Length of
Stroke, 11/4".
Stroke Adjust-
ment, 13/4".
WRITE FOR
COMPLETE
CIRCULAR.

Whitney Metal Tool Co.
110 FORBES ST. ROCKFORD, ILL.

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NOW

As Many Spindles As You Need



In ONE Low Cost Delta Unit

\$983.50

8-Spindle 17" Drill Press
Unit with No. 2 Morse
Taper Spindles—com-
plete with bench legs
and table, but with-
out motors.

With this new low-cost set-up, you can have just the number of spindles you need—one, two, three, six, eight—any number that meets your exact requirements. You can have any type of Delta 17" or 14" drill press heads—all 17"—all 14"—or any combination of both—spaced at any distance you desire, either close together or far apart.

This new development gives you an efficient continuous drilling and tapping production line, eliminating costly transferring from one drill press to another—and at the same time provides maximum working surface. Best of all, the cost of this new kind of set-up is a fraction of what special set-ups of this type formerly cost.

Built up of sectional tables, the table surface is 23 $\frac{3}{8}$ " by 125". Center to center between spindles is 15" maximum distance. Chuck to table 26". Quill has 5" stroke, drilling capacity is $\frac{3}{4}$ " in cast iron.

For full details on this new "Tailor-made" drill press development—write us today, telling how many drill press heads you could use on a set-up like this, whether you need 17" or 14" heads or a combination of both, and how far apart you want the heads placed. We will gladly send you complete specifications, prices and any other information you wish.

DELTA MFG. CO.

689 E. Vienna Ave., Milwaukee, Wis.

Please send us without obligation full information re your new drill press development. We are interested in _____ drill presses on this set up, _____ 17", _____ 14", spaced _____ inches apart.

Name _____ Address _____
City _____ State _____

DELTA Mfg. Co.
INDUSTRIAL DIVISION
689 E. VIENNA AVE. MILWAUKEE, WIS.

up stroke, it stops, the pressure is released, and the pump and motor run idle.

Without the loose bolster this press is a complete machine. However, standard bolsters may be applied at any convenient vertical location. Bolster supports are also available.

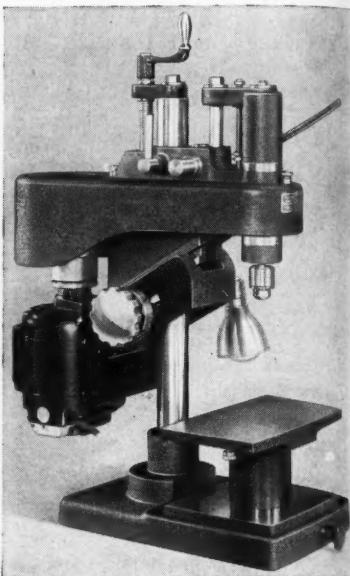
The Type DLKC2 press is available with either manual or electric control. The electric controls, however, offer the maximum in speed and safety. Two operating push buttons are arranged so that both buttons must be operated simultaneously, ensuring that both hands of the operator are in the safe zone. The manually controlled press can be furnished with a hand lever or with a foot pedal, or with both controls.

The Type DLKC2-5 press is built in heights of 91 to 103 in., with a base 40 in. long by 24 in. wide. Weights, with motor, run from 2,850 to 3,150 lb. The DLKC2-15 press is built in heights of 96 to 107½ in. with a base 47½ by 28 in. and weighing, with motor, from 5,150 to 5,400 pounds.

Maxi-Varimatic Super Sensitive Drilling Machine

A super sensitive drilling machine which is said to be a radical departure in ranges of speed, sensitivity, ease of operation and all-around performance, has been brought out by The Hamilton Tool Company, Hamilton, Ohio. The machine is said to be built with instrument precision and the manufacturer claims that it can be used with confidence on the finest work in toolrooms, instrument departments, Diesel, electrical, or aircraft manufacturing, and other work involving precision operations.

An infinitely variable range of speed is available through the use of two step pulleys. The complete speed range of the machine is from 840 r.p.m.



Maxi-Varimatic Super Sensitive Drilling Machine

9,300 r.p.m., power being supplied through a constant speed 1,725 r.p.m. motor. Higher minimum and greater maximum speeds can be obtained by merely changing the driving pulley and belt. A graduated speed dial on the handwheel shows the speed at which the spindle is operating.

The drilling unit is self-contained.



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ALSO FOR SAWING
AND STONING

bushings for all running parts; holding chucks and clamping device provide positive file alignment. Write for descriptive literature today.

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ILLINOIS DIE FILING MACHINE

The ILLINOIS Die Filing Machine is built to produce more accurate filing work. Vibration is eliminated by perfectly balanced moving parts, hardened and ground to minimize wear. Accuracy is maintained with broad

of speed
of two
speed range
r.p.m.

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These men are the cream of purchasing power in your field. Last year's 33,000 registration included a high percentage of Presidents . . . Vice-Presidents . . . Treasurers . . . Managers . . . Metallurgists . . . Engineers . . . Superintendents . . . Chemists . . . Purchasing Agents—men who specify and buy every type of metal product.

More manufacturers than ever before will exhibit in this year's National Metal Exposition at Cleveland. There are still plenty of choice spaces left at the regular \$1.00 per sq. ft. rate. Write or wire collect today for floor plan and full information. Address: W. H. Eisenman, Managing Director, National Metal Exposition, 7301 Euclid Avenue, Cleveland, Ohio.



BIGGEST IN HISTORY!

Over 215 leading manufacturers have already reserved 50,000 square feet of exhibit space . . . making the 1940 National Metal Exposition the largest in the 22 years it has been managed by the American Society for Metals . . . proof that more and more companies find selling easier the Metal Exposition Way.



GUARANTEED ATTENDANCE!

Four national engineering societies: American Society for Metals; American Welding Society; The Wire Association; and Iron & Steel Division and Institute of Metals Division, American Institute of Mining & Metallurgical Engineers . . . hold their annual Metal Congress in conjunction with the Metal Exposition . . . assuring the highest type attendance.



STRATEGIC LOCATION!

Cleveland is the hub of the most diversified manufacturing district in the country . . . home of many large industrial organizations . . . easily accessible from all parts of the country . . . ample convention facilities . . . a city in which many successful Metal Expositions have been held.



NEW AIDS TO PRODUCTION!

If you have a new aid to production . . . a better metal . . . a faster machine—your business demands representation with other leading companies at the Metal Exposition because buyers for every big industry will be shopping there. Get your share of the rush business ahead . . . exhibit at the Metal Exposition!



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AND METAL CONGRESS
OCTOBER 21-25, 1940 Cleveland, Ohio

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AMERICAN SOCIETY FOR METALS

swings radially on the column and can be locked in any position. The 6½-in. vertical adjustment of the drilling unit is accomplished by means of an elevating screw.

The base is 15½ x 10 in. and the base pad is accurately machined to 8 x 8 in. A round table, 5½ in. in diameter, is also supplied and a rectangular table 10 x 6 in. is fitted over the round table. Overhang of drilling unit from center of chuck to unit is 5 in. Maximum distance from base to chuck, 14 in., and from round table to chuck, 10 in. A 2½-in. vertical travel of the chuck spindle is obtained through a 14-position universal ratchet. The spindle pulley is mounted on individual ball bearings and torsional loads of drilling are carried by the spindle. All moving parts are completely guarded. Provision is made to illuminate the work surface when 110 or 220 volt current is used. The machine is ready for service immediately upon plugging into an outlet. Machine size, 24 in. deep, 28 in. high, 10 in. wide. Weight, 160 pounds.

Micro Multi-Purpose Bender

Designed to eliminate the necessity of making forming dies in cases where only a small number of parts are to be formed, thereby cutting costs, saving time and labor, and increasing production, the Micro Multi-Purpose Bender illustrated herewith, product of the O'Neill-Irwin Manufacturing Co., 316 Eighth Ave., South, Minneapolis, Minn., is designed to accurately bend round, square, or flat rod, tube, wire, and strip stock. The unit can be used to form hooks, eyes, loops, springs, angles, brackets, and various odd shapes. It is said to form any radius of from 0

to 6 in. in diameter. Parts to be formed may be cut to exact length before forming, thus effecting a saving in material and eliminating loss.

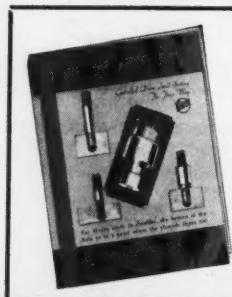
A life-time tool, all service parts



Micro Multi-Purpose Bender

hardened and tempered steel. The Micro Multi-Purpose Bender is a precision bench or vise tool, the hexagon shape of the base permitting six convenient positions for vise operation. The unit is provided with adjustable control automatically governed by the size of material being formed.

According to the manufacturer, the Micro Multi-Purpose Bender will duplicate parts to the one thousandth of an inch, depending upon the material being



If it's STUD SETTING—It's our SPECIALTY

We can supply the proper tool for all sizes and types of stud setting—from 4-40 to 3" and larger if needed. Tools that are designed for small lots or large, for all standard and special types of studs, electric, pneumatic, machine tool or hand drive.

*Send us a sample stud or sketch
• for practical suggestions •*

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AMERICAN SWISS Files of Precision

Comparative tests prove that American-Swiss Files give greater "file-age." One survey made among file users showed that American-Swiss files last 25% to 50% longer than others, and many concerns have written us that these files produce better results at lower cost.

Only the Best are good enough



Look for this trade mark on every tang. Over 2500 different types, sizes and cuts.

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American Swiss File & Tool Co.
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Improved Anderson
Balancing
Ways
No Leveling
Required
A simple and
excellent devi-
ce for bal-
anci n g ,
straightening
and trueing.

They are made in
the following sizes:

Swing	Greatest Distance Between Standards	Capacity in lbs.
20 in.	20 in.	1,000
40 in.	30 in.	2,000
60 in.	30 in.	2,000
72 in.	66 in.	5,000
96 in.	88 in.	10,000

Four-Chilled
iron-discs
rotate on
sensitive
Special
bearings.



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by Anderson Bros. Mfg. Co.
1926 Kishwaukee St.

Rockford, Ill.



With TRU-LAY Push-Pull Controls you can have variable control points from which operators can work to best advantage. The point of control can be changed at will to meet changing requirements.

TRU-LAY Push-Pull Controls instantly transmit the slightest control impulse. They hold any position to which they are set.

These controls are easily installed—merely snaked around obstructions—and are easily adapted to the remote operation of valves, clutches, switches and other mechanisms. They require no maintenance attention and can't become noisy or "sloppy" in operation.



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Control" points out
many advantages
you can have in
machine control.

AMERICAN CABLE DIVISION
American Chain & Cable Company, Inc.
230 Park Avenue, New York, N. Y.

Please send complete information on
TRU-LAY Push-Pull Control.

Name.....

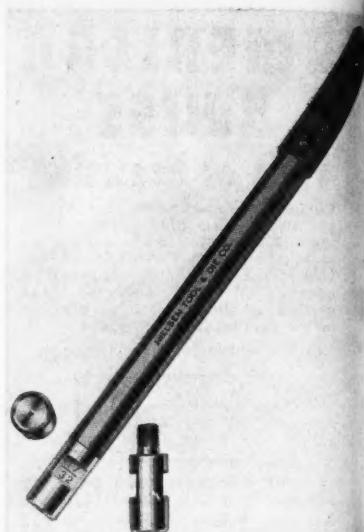
Address.....

City..... State.....

shaped. Setups, it is claimed, may be quickly changed from one job to another and back again with the assurance of accuracy. The unit, the manufacturer states, eliminates the cost of special tools and jigs for individual or duplication jobs and will not kink or flatten tubes in the process of bending. Special attachments are optional for forming tubes and irregular shapes.

Nielsen Transfer Screw and Punch Set

A method for transferring screw and stud holes as well as blind drill holes from a drilled surface to another that is to be drilled in duplicate has been made possible by the development of the Nielsen Transfer Screw and Punch Set now available from Nielsen Tool & Die Company, 1863 Gardner Ave., Berkley, Mich. Layout punches for the use of tool and die makers, machinery builders, erectors and machine repair shops are made to transfer drill holes through a drilled section in diameters from $17/64$ to $59/64$ in. The punch is made with a case hardened tip that is removable for



Nielsen Transfer Screw and Punch Set

replacement and, when a solid blow is struck on the punch head, will transfer the drill center and drill circle with complete accuracy.

This method is an extension of the procedure used in transferring blind screw and stud holes through the use of Nielsen transfer screws. Among the many economies claimed for its use are the availability for either new or old work and the fact that layout marks cannot be lost because of the drill or drilling fluids erasing a layout made with dividers. The center and drill circle penetrate steel to a depth of 0.01 in. Transfer screws are made with shoulder support of uniform height, the

Having difficulty holding tolerances?

Demand the
ZIEGLER
 ROLLER DRIVE
Floating Holder
 for
TAPS and REAMERS



• AUTOMATICALLY compensates for machine spindle misalignment, eliminating over-sized or bell-mouthed holes.

- Helps produce unbelievable accuracy on both new and old equipment.
- Furnished with male or female taper, straight, threaded or special shanks to fit any machine used for tapping or reaming.

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 1926 Twelfth Street Detroit, Michigan

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NEW Francis-Reed IMPROVED BENCH DRILL No. 25

*Individual
Motor Drive
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Precision Production
Machine. Ball bearings
throughout. All
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Infinite Speed Range:

1500
to
9000
r.p.m.
instantly
available.



Indicator shows speed of spindle.
Available with from one to four spindles.

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Now you have to SPLIT THE SPLIT HAIR

With demands for precision in
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than ever before, your need for
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Complete sets in case begin at \$23.

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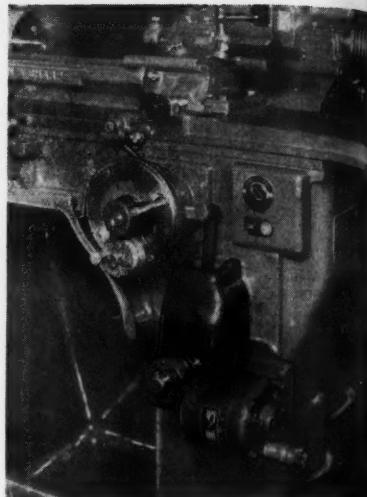
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permitting holes of various sizes to be transferred in the same plane at one impression.

B & S Independent Automatic Cross Feed Arrangement

An independent automatic cross feed arrangement for Brown & Sharpe No. 5 Plain Grinding Machines is announced by the Brown & Sharpe Mfg. Co., Providence, R. I. According to the manufacturer, automatic straight-in-feed grinding (with the machine table stationary) may be performed on the No. 5 plain grinding machine with the addition of the independent automatic cross feed arrangement, which gives to the machine all the advantages of power plunge-cutting with no change in its regular capacities or operating convenience. The unit furnishes 172 plunge-cut feeds or pick per minute, with the amount of feed adjustable by quarter-thousandths from 0.00025 to 0.0045 in. per pick. As with the regular cross feed, the stopping point can be set by increments of 0.0001 inch.

A separately-controlled 1/20-h.p. gear-



B & S Independent Automatic Cross Feed Arrangement

head motor mounted at the right front of the machine drives continuously variable-radius crank mechanism which is mounted below the similar unit regularly a part of the machine. The mechanism includes a vertical link which transmits motion to the cross feed path from either of the two crank mechanisms. Selection of feed for traversing or straight-in-feed grinding is made simply by connecting the link to the proper crank mechanism by means of a machine screw and hardened bushing fitting either of two holes in the link. Amount of feed per pick of the path is selected simultaneously by means of a pointer and a scale on the rotating member before the screw is tightened.

PRESS SHOP and DIE ROOM SUPERINTENDENTS

No. 97 Lubricant stays on friction surfaces or heels of cam dies and on die guide pins. Prevents excessive wear at these high pressure points without the necessity of frequent applications.

Packed in 1, 5, and 10 gallon pails and 55 gallon drums. Send for sample.

WAYNE CHEMICAL PRODUCTS CO.
Manufacturers of 3B and No-Sep Tapping Oils
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THE KOCH TEST INDICATOR

The Koch Test Indicator has now added new improvements for better vision and more accuracy. The only toolmakers' Indicator on the market with two working ends. One end to test outside surfaces, the other inside.

The Koch Test Indicator is constructed so that the plunger moves away from, instead of against the lever, preventing the delicate parts from being broken by a sudden or excessive jolt of the plungers. It is shock proof. Each graduation on the scale represents 1-1000 of a inch movement of the plunger. Send for bulletin. Price of Indicator \$5.00.

THE KOCH TEST INDICATOR Phone Nyack 2222 28 2nd Ave., Nyack, N.Y.

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Toolmaker, Machinist Needs



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BROKEN TAPS
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No annealing, drilling, or delaying of work.
Stock sizes from No. 4 machine screw to 1 1/2", in 2, 3, or 4-flute styles.
In world-wide use for 32 years on both production and maintenance tapping.

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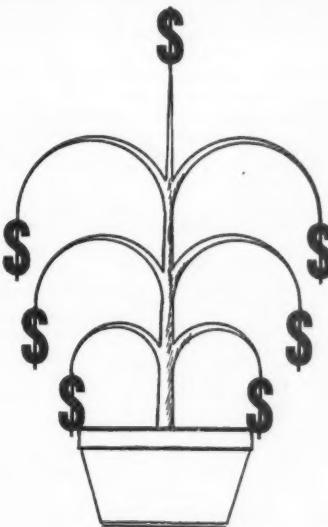
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98 ALLYN ST.
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**A FAST TRACK
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Pneumatic tools, like most thoroughbreds, perform best under ideal conditions. Norgren Sight Feed Automatic Air Line Lubricators condition the tool (lubricate it) by injecting an accurately controlled oil fog into the air stream — a scientific spur for air tools. Write today for specifications, sizes and prices.

C. A. Norgren Co., Inc.
216 SANTA FE DRIVE DENVER, COLORADO



**PICK PROFITS
FROM OUR NEW PLANT**

The greatly increased production facilities of our new plant assure you of prompt service and delivery on "profit-making" DICKERMAN Die Feeds and Hitch Feeds.

These Feeds are designed for quick set-ups on short or long runs. Write for complete information.

H. E. DICKERMAN MFG. CO.
321 Albany St., Springfield, Mass.

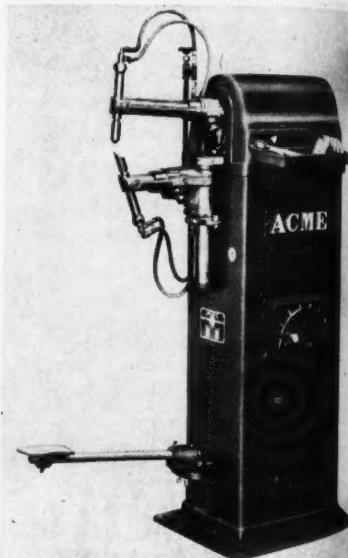
The entire arrangement is extremely simple and compact and is effectively guarded for safety.

The B & S Independent Automatic Cross Feed Arrangement is furnished at extra cost and must be applied to the machine before shipment from the factory. Application of the arrangement increases the weight of the machine by approximately 15 pounds.

Type 1 Acme "Hot Spot" Welder

The Acme Electric Welder Company, 5619 Pacific Blvd., Huntington Park, Cal., announces an improved line of foot-operated rocker arm type spot welders with all welded fabricated steel bases and incorporating many innovations and distinctive features.

The Type 0 with stationary lower horn holder and the Type 1 with swivel lower horn holder are manufactured in 10, 15 and 20 KVA capacities and in throat lengths of from 12 to 36 in., complete with water-cooling equipment. A clamping block device retains the horns in the horn holders with ideal electrical



Type 1 Acme "Hot Spot" Welder

contact, yet a half turn of a $\frac{1}{4}$ -in. diameter set screw instantly releases change of set-up.

Horns are universal double end reversible, one end machined, to hold electrodes at 90 deg. angle and opposite 22 $\frac{1}{2}$ deg. angle. Complete details of Type 0 and Type 1 spot welders described in Bulletin No. 50 which will be sent on request. Other spot welders in the line include foot-operated machines up to 75 KVA and automatic operated production machines up to 500 KVA.

MAXI-JR.-E.

Super Sensitive Drilling Machine

For small holes .004" to .250" diameter. Self-contained drilling unit swings radially on column and locks to any position. All controls manually operated. 8" vertical adjustment of drilling unit with elevating screw.



Horizontal work capacity to center, 9 $\frac{1}{2}$ in. Vertical work capacity, 10". Spindle speeds, 750 to 12000 r.p.m.

Write for catalog.

THE HAMILTON TOOL CO.
EST. 1881. HAMILTON, OHIO

"Ridgid" Ratchet and Three Way Threaders

Five ratchet and three-way threaders for small pipe have been added to the "Ridgid" line of pipe tools manufactured by The Ridge Tool Company of Elyria, Ohio. The ratchet threaders which are designated as the Nos. 0, 0R, and 11R, are strongly designed all-steel malleable alloy and will thread $\frac{1}{8}$ to $1\frac{1}{4}$ -in. pipe. Separate sets of self-high-speed tool steel chaser dies can be accurately cut and easily removed for regrinding. In the No. 00R threader,

BURKE Milling Machines



Mounted
on
Cabinet
Column

Burke motor driven milling machines Nos. 1, 2, 3, and 4 are specially suited for handling small, difficult work on a production basis.

Write for complete information.

BURKE MACHINE TOOL CO.
27 E. 16th St.

Conneaut, Ohio

IMPROVED ROTARY SURFACE GRINDER

Powering or raising wheel head automatically starts or stops the table and magnetizes or demagnetizes 12" magnetic chuck. Other features include wheel head locking device and adjustment of upper portion of column for grinding saws, cutters, etc., having hubs up to 6" diameter. Six table speeds are available and a foot brake facilitates quick stopping of table.

S. WALKER COMPANY, INC.
WORCESTER • MASS.

**Why Use A Shaper
to cut Keyways when a**

**DAVIS
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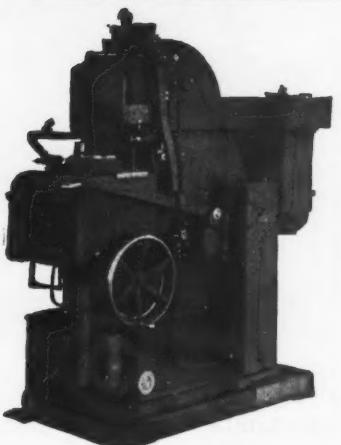
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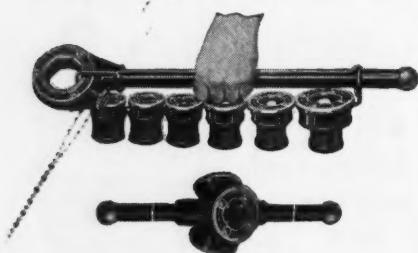


DAVIS KEYSEATER CO.
Exchange and Glasgow Sts.
ROCHESTER, N. Y.

WALKER



heads are quickly locked or removed by a pull of the ratchet knob. With the Nos. 0R and 11R threaders, die heads can be snapped into the ratchet ring



(Above) "Ridgid" Nos. 0R and 11R Ratchet Threaders. (Below) "Ridgid" Nos. 30A and 31A Three-Way Ratchet Threaders

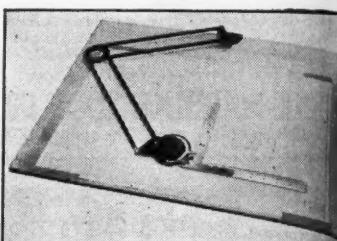
from either side to prevent falling out and are easily pushed out for changing. Electrical conduit dies can be furnished at regular die prices. No special dies are needed for threading pipe close to wall; all that is required is to turn the dies upside-down and shift to positions marked on the die heads. A carrier

which conveniently holds the ratchet ring and set of dies is supplied with all complete sets at no extra cost.

The Ridgid Three-Way Threaders which are designated as Series Nos. 30A and 31A, have virtually the same features as the series described above. They are compact, have double ball-bearing handles, and thread pipe from $\frac{1}{2}$ to 1 inch.

Wrigraph Industro Drafter

A completely adjustable ball bearing drafting machine for drawings up to $\frac{1}{2}$ x 36 in. has been placed on the market by L. G. Wright, Inc., 5209-58 Euclid Ave., Cleveland, Ohio, under the trade name of "Wrigraph Industro Drafter". The machine is a precision instrument which can be clamped onto any drawing board up to 2 in. thick and 36 in. wide.



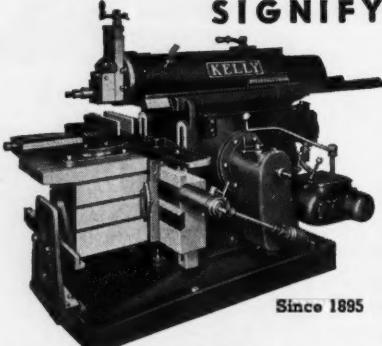
Wrigraph Industro Drafter

A variety of extension clamps are available for mounting the machine on wide drawing boards. The Wrigraph Industro Drafter has a hinged mounting which permits it to be raised clear of the board. A leveling screw is provided to adjust the machine to the plane of the drawing board.

The Wrigraph Industro Drafter is equipped with exclusive eccentric adjustments through which the unit is calibrated and the accuracy of the instrument is controlled. The arms of the unit are of specially rolled channel steel, giving great rigidity. All steel parts are finished in black baked wrinkled enamel. Eight hardened ball bearing assemblies are adjustable. The protractor head is controlled with the left hand. A $\frac{1}{2}$ -deg. vernier equipped with a magnifier provides for a quick and accurate setting of all angles.

Standard Wrigraph transparent edge engine-divided scales are available.

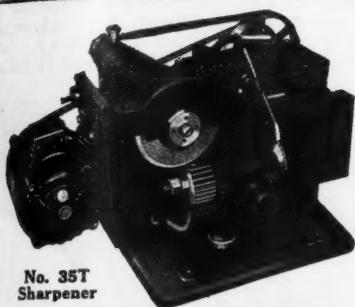
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AUTOMATICALLY SHARPENS METAL SAWS IN GANGS

Up to 5½" diameter and up to 1¾" thickness. 100 SAWS of 26 GAUGE CAN BE SHARPENED AT ONE TIME.

The saws are automatically indexed and sharpened within a variation of plus or minus .001 of exact diameter of entire lot.

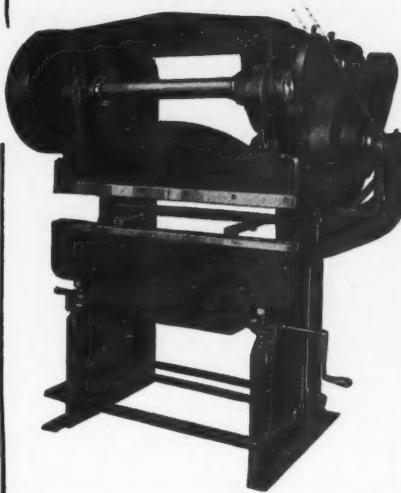
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THE WARDWELL MFG. CO.

3166 Fulton Rd. • Cleveland, O.

CHICAGO STEEL PRESS

No. 253



**Does 40% to 60% of the
forming work turned out
by the average shop.**

Here's a profitable, economical brake ideally adapted for rapidly forming metal sections such as in stoves, refrigerators, soda fountains, steel cabinets, metal furniture, steel boxes, and a great variety of sheet metal specialties. Its variable speed drive operates from 17 to 50 strokes per minute. The No. 253 CHICAGO STEEL PRESS is accurate, compact, and ruggedly constructed of highest quality materials.

Sizes 4, 5 and 6 ft. capacities up to 10 gauge.

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**DREIS & KRUMP MFG.
Company
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GRANT
Noiseless Spinning Riveters

2 to 6
Spindles

Head rivets from smallest to 3/16" diameter. Built with automatic trip or foot operation. Other types include Double-Spindle Horizontal and Single-Spindle Vertical Noiseless Rivet Spinning Machines, and Single-Spindle Vertical Hammer type Riveters.

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FOR
FOLDER

The GRANT MFG. & MACHINE Co.
96 Silvers Ave.
BRIDGEPORT, CONN.

all standard graduations. These unusual scales are designed in such a way that they touch the drawing paper at the front and rear edges only. A thin square drawing edge on the scale makes it possible to use either pen or pencil. The Wrigraph Industro Drafter is available in four standard models, the largest covering a drawing area of 24 x 36 inches.

Eastern Model E Centrifugal Pump

The Eastern Engineering Co., 45 Fox St., New Haven, Conn., announces the addition of a Model E pump to its line of Midget centrifugal pumps. The pump, according to the manufacturer, is sturdily constructed for long-hour service and, due to its light weight and small size, is particularly adaptable to all installations requiring the pumping of thin liquids where weight and space involved must be kept at a minimum. The unit has a maximum pressure of from 20 to 25 lbs. per sq. in. and a maximum volume of 8 gal. per minute.

The Model E pump is 7½ in. long, 3¾ in. high, 3¾ in. wide, and weighs

6 lbs. It has a total internal volume of 12 cc. and is powered by a universal heavy duty fan-cooled, 1/20-h.p. 110 volt, a.c. or d.c. motor. The stu-



Eastern Model E Centrifugal Pump

box of the pump is adjustable by means of a hand-operated adjustment wheel and the motor armature and pump impeller are mounted on a single shaft to eliminate coupling and to assure perfect alignment. The Model E centrifugal pump is offered as standard in monel metal, stainless steel, and aluminum plated bronze construction. It is also available in other metals and alloys and can be furnished in smaller sizes.



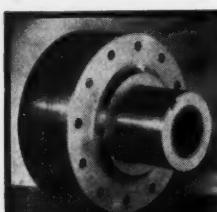
NICHOLSON EXPANDING MANDRELS—for holding any job with bores from ½" to 7" while being machined on lathes, grinders, or millers. Fourteen sizes—great time savers.

OTHER PRODUCTS: Steam Traps, Chromium Plated Steel and Stainless Steel Floats, Compressed Air Traps, Flexible Couplings, Steam and Air Separators, Arbor Presses.

CONTROL VALVES.
flat disc type —
for operating single
and double acting
air, steam, water or
oil cylinders. ¼" to 1½" sizes.



W. H. NICHOLSON & CO.
136 Oregon St. Wilkes-Barre, Pa.



THERE'S A HILLIARD CLUTCH FOR EVERY JOB...

THE HILLIARD OVER-RUNNING CLUTCH... Four important functions: Automatic dual drive operation of any equipment with any type of prime movers... Automatic operation of 2-speed drives... As a ratchet, permitting infinite adjustment... As an automatic back-stop. Write for booklet giving full information.

THE HILLIARD CORPORATION • 117 W. 4th St., Elmira, N. Y.
Chicago Office, 201 North Wells St.

HILLIARD CLUTCHES • ELMIRA, N. Y.

Fairbanks-Morse Vertical Single Phase Motors

Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Ill., has announced a line of integral horsepower vertical single phase motors in sizes from $\frac{1}{4}$ to 5 h.p. which, because of its combination of electrical and mechanical char-



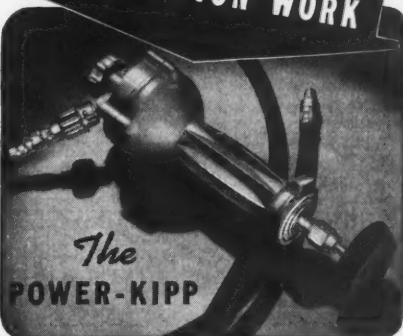
Fairbanks-Morse Vertical Single Phase Motor

acteristics, is unusually adaptable to operation in isolated localities.

Dripping or splashing water will not harm the motors under normal operating conditions, since the design prevents water from reaching vital parts. The frame, bearing brackets, and enclosing covers give maximum protection consistent with adequate ventilation. One characteristic is the exceptional quietness with which the motors operate. Even at speeds of 3,600 r.p.m., they are considered unusually quiet and free from vibration.

Solid or hollow shaft modifications can be furnished. The solid shaft units are usually direct-connected to a pump or machine through a flexible coupling. The hollow shaft unit is particularly well adapted to vertical pump applications because of the advantages of compactness, permanent shaft alignment, and high thrust capacity. This

TRY THIS
TIME SAVER IN
PRODUCTION WORK



KIPP air GRINDER

The Power Kipp Model VT, has a controlled speed of 12,000 R.P.M., takes wheels up to $2\frac{1}{2}$ " diameter, discs up to $4\frac{1}{4}$ ". Production executives find it a time saver in production work, as great as the high speed Kipp Air Grinders in Tool Room Work. VT sells at \$58.75, other Kipp Air Grinders sell from \$9.75 to \$40.75, Chippers and Filers at \$19.75. Kipp Air Tools give you highest speeds, lowest prices. New Catalog gives details.

10 DAY FREE TRIAL
NO OBLIGATIONS



Send Power Kipp Model VT
on your 10 day Free Trial
Offer!

Send the New Kipp Air
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Name. _____

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MADISON-KIPP CORPORATION
208 WAUBESA ST., MADISON, WIS., U.S.A.

type of construction provides an easy and convenient method of installation, since the pump shaft extends up through the motor shaft instead of joining it with a coupling.

The pump shaft is held in place by adjustable lock nuts above the upper motor bearing, which is designed to support the entire thrust load including weight of the shaft, rotating parts of the pump, and the load imposed by the column of liquid being lifted. Protecting against accidental damage due to the unscrewing of the pump shaft is a

two-jaw clutch which disengages the motor from the pump should the motor be accidentally connected for reverse rotation.

Operating speeds are 1,200, 1,800 and 3,600 r.p.m. All 1,800 r.p.m. and lower speed motors are built in the repulsion start induction-run type. The 3,600 r.p.m. rating starts as a repulsion motor and as the speed rises, the squirrel-cage winding in the rotor picks up a large portion of the load automatically in much the same manner as does the inner winding of a double-squirrel-cage rotor in a polyphase motor.

All coil windings are repeatedly dipped and baked in an insulating material consisting of a heavy-bodied, permanently-pliable compound selected for its moisture, oil and acid-resisting qualities.

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KARNETICS MAGNETIC HOLDING DEVICES

For Use On Any Magnetic Chuck

GRINDS IRREGULAR SHAPES
AS EASILY AS FLAT
SHAPED PIECES



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Literature

PARALLELS
"V" BLOCKS
PROTRACTOR
BLOCK

MANUFACTURED BY THE MAKERS OF
THE KAR DUO MAGNETIC CHUCK
THE SINE ANGLE PLATE

THE KAR ENGINEERING CO., Inc.
200 Hudson Street

New York City

Callite Special Wire Sizes

Callite Tungsten Corporation, Union City, N. J., has taken over the business of the former Harris Alloys, Inc., and Harris Alloys will henceforth be conducted as a division of and under the corporate name of the Callite Tungsten Corporation. This assimilation of the business of Harris Alloys enables Callite Tungsten Corporation to add to its regular list of products a line of special wires in sizes down to 0.001 in. including aluminum, stainless steel, nickel steel, Everdur, brass in all grades, brush wire, commercial bronze, phosphor bronze and Fourdriniering, silver and monel. The extensive engineering and development facilities of Callite Tungsten Corporation now become available to this division and are likewise extended to manufacturers or others having special wire problems.

NOW! DEMAGNETIZE ON THE



KAR DUO MAGNETIC CHUCK
HOLDS PIECES TO BE GROUNDED
AND SAME UNIT DEMAGNETIZES THE
WORK WITHOUT A SEPARATE DE-
MAGNETIZER.

THE KAR ENGINEERING CO., Inc. - 200 Hudson St., New York City

"Weld-Bilt" Hydraulic Die Lifter

Designed principally for use in handling heavy dies, the portable "Weld-Bilt" Hydraulic Die Lifter introduced by the West Bend Equipment Company, West Bend, Wis., is said to serve a surprising number of needs in all types of manufacturing plants.

Hand operated, the lifter has a full hydraulic raising and lowering unit mounted horizontally beneath the platform, with finger-tip control located at the top of the operating handle. The platform has a net lift of 4 ft. and lowers within 8 in. of the floor. Compact in every detail of design and construction, the lifter requires only a small amount of space for maneuvering and operation, no full swing of the handle being necessary. The pump handle can be locked in several positions for extra maneuverability and handling ease. Arc-welded construction is used throughout. Standard equipment includes two swivel casters at the handle end with 7-in. wheels under the platform. A double-cable lift is provided which can be equipped with safety switches if desired.

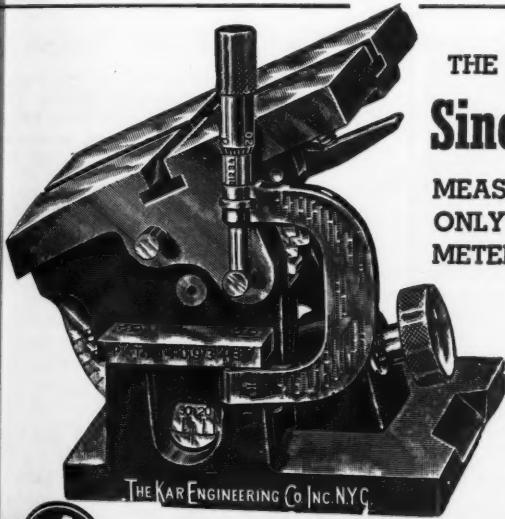
The standard size is 24 in. x 24 in. x 5 ft. 6 in.; capacity, 500 lb. Larger units are available with capacities up to 2,500 pounds.

Timken "SS" Type Bearing Series

The Timken Roller Bearing Company, Canton, Ohio, has put into production a bearing series of the standard "SS" type. The first bearing in this series is 9285-9220, with a cone bore of 3 in., O.D. of $6\frac{1}{8}$ in., and width of $1\frac{1}{8}$ in. At 500 r.p.m. the bearing has a radial capacity of 6,255 lb., and a thrust capacity of 8,710 pounds.

The 9100, 9300 and 90000 series bearings of the "SS" type have also been redesigned to reduce the outside diameters and widths of each series while still maintaining the same load-carrying capacities. Two cone bores of $2\frac{7}{16}$ and $2\frac{1}{8}$ in. are available in the 9100 series. Two different bores of 3 and $3\frac{1}{8}$ in. are available in the 9300 series and one cone bore of $3\frac{1}{8}$ in. in the 90000 series.

These series, in addition to those now available in the "SS" type, provide a



THE NEW AND IMPROVED Sine Angle Plate

MEASURES EXACT ANGLES.
ONLY A TWO-INCH MICRO-
METER IS REQUIRED.

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THE KAR ENGINEERING COMPANY, Inc.

200 HUDSON STREET

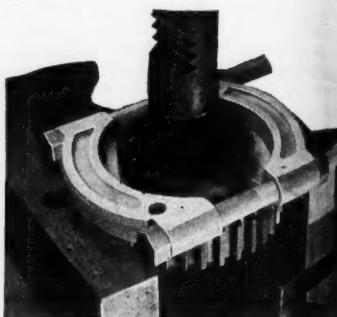
NEW YORK, N. Y.

wide range of capacities, varying in cone bores from $\frac{1}{4}$ to $12\frac{1}{2}$ in. The "SS" series are single row bearings with steep cup and cone angles. They are designed primarily to handle loading conditions where thrust loads are large compared to the radial loads. Their design embodies the primary Timken principles of "On Apex" construction, which assures true rolling motion, and positively aligned rolls, which prevent roll skewing. The multiple perforated Timken cage retains the rolls equally spaced around the bearing periphery.

OTC Puller Attachment

A device for use in removing difficult parts from various types of machine tools, designated as the OTC Puller Attachment, has been brought out by the Owatonna Tool Co., 357 Cedar St., Owatonna, Minn. The illustration herewith shows the attachment being used as a bedplate in an arbor press to remove a bearing that is pressed on flush against a gear. The knife-like edges of the tool are forced between the bearing and the gear so that the pulling strain is against the inner race of the bearing. In this

manner, the bearing can be removed intact, quickly, and without danger to the operator. Pinions, gears, and other



OTC Puller Attachment Being Used
Remove a Bearing in an Arbor Press

parts can also be removed by this method with the attachment.

The OTC Puller Attachment can be used with OTC Grip-o-matic Pullers and Push-Pullers and is available in three sizes. The smallest size has a range from 0 to $4\frac{1}{4}$ in. and the largest a range of from 1 to 10 inches.

with Dylint M Steel Blue

**DYKEM STEEL BLUE
STOPS LOSSES
making dies & templates**

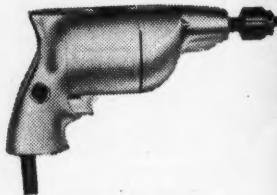
Simply brush on; ready for the layout in a few minutes. The dark blue background makes the layout lines show up in a sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

Write for full information

THE DYKEM COMPANY
2801 F North 11th St. • ST. LOUIS, MO.
(In Canada: 3194 Dundas St. W., Toronto, Ont.)

Black & Decker Tapgun

With the introduction of the Tapgun to its line, The Black & Decker Mfg. Co., Towson, Md., now has three powerful one-handed, high speed production tools of identical grip, build, and b



Black & Decker Tapgun

alance—the Holgun, Scrugun, and Tapgun. The Tapgun weighs only $3\frac{1}{2}$ lbs. and measures $9\frac{1}{4}$ in. overall, and taps up to $\frac{1}{4}$ in. in cast iron, $\frac{1}{8}$ in. in steel, $\frac{1}{16}$ in. in brass or aluminum. It taps at 400 r.p.m. and backs out at 525 r.p.m.

This tool augments the No. 22 Tapper which has been in the line for some years and which is a heavier tool of greater capacity. The No. 22 has

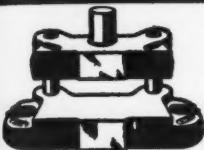
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BAUMBACH



STANDARDIZED

Machined Steel Semi-Steel

DIE SETS

DROP FORGED STEEL

Standardized Die Sets, embodying many exclusive features, a listing of more than 195,000 stock sizes and 46 different styles afford a service that is unsurpassed.

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 1806 S. Kilbourne Ave. Chicago, Ill.

**GUARD AGAINST a
Dirt and Dust SABOTAGE**
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CADILLAC
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BLOWER & SUCTION CLEANER

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Your equipment needs protection against the "fifth column" activities of dirt and dust. It's your protection against dangerous fire hazards and costly repair jobs.

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Modern Shops Choose

" HALLOWELL "
STEEL WORK - BENCHES

No more expensive than old-fashioned wood benches, "Hallowell" Steel Benches bring you the advantages of permanently smooth, wear-free tops... lasting rigidity...easy movability which permits flexible shop arrangements. And they're easy to keep clean, can't soak up oil or splinter and split under rough treatment.

More than one thousand styles and models, with high grade laminated wood tops if preferred, are available from stock to meet your needs exactly and promptly. Shipped knocked down. Write or ask your distributor.



Pat'd. and Pat's. Pend'g.
 Fig. 732
 Drawer is extra

STANDARD PRESSED STEEL CO.
 JENKINTOWN, PENNA. BOX 556

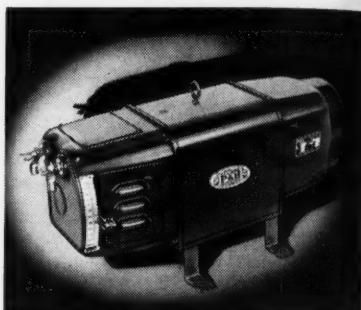
BOSTON - DETROIT - INDIANAPOLIS - CHICAGO - ST. LOUIS - SAN FRANCISCO

capacity of $\frac{3}{8}$ in. in cast iron, $\frac{1}{4}$ in. in steel, and $\frac{1}{2}$ in. in brass or aluminum. The Holgun and Scrugun are, respectively, a powerful $\frac{1}{4}$ -in. drill and a high speed screwdriver for screws from No. 4 to No. 10.

P&H-Hansen WD-150 Arc Welder

Illustrated herewith is the P&H-Hansen WD-150 Arc Welder which has been placed on the market by the Harnischfeger Corp., 4400 W. National Ave., Milwaukee, Wis. The welder measures less than 33 in. in length and 1 ft. in height, and is said to deliver uniform welding currents ranging from 200 down to 15 amperes. Current selection is simplified by a single control on the WD-150. Once the current setting has been made, the generator, it is said, automatically responds with the desired arc length under all welding conditions. Mis-synchronization of open circuit and arc voltage is claimed to be impossible because of the automatic volt-ampere regulation, self-excitation, and internal current stabilization of the machine.

According to the manufacturer, the P&H-Hansen WD-150 Arc Welder features a square frame design, two outstanding advantages of which are (1) the square frame design permits an overall compactness which in turn means more machine in less space as well as convenient stacking of the units and (2) the square frame design permits better arrangement of coils, and

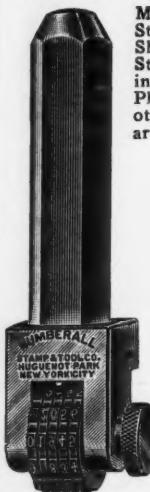


P&H Hansen WD-150 Arc Welder

so on, which in turn provides better magnetic balance and greater cooling areas of the coils. With greater coil surface exposed to the air circulating air screens, the internal temperature is said to be substantially lower, thereby assuring long life and a uniform flow of electrical current.

The P&H-Hansen WD-150 Arc Welder is available with stationary or portable mountings.

Mark It Quickly with a NUMBERALL



Made with 1 to 10 wheels.
Stamp in perfect alignment.
Shank for Hand or Press
Stamping. Platform for stamping
Name
Plates and
other small
articles.



NEW Quick Set Machine. One wheel can be turned quickly by knurled knob for consecutive numbering.

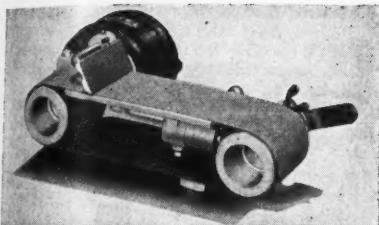
NUMBERALL STAMP & TOOL CO.

Huguenot Park,
Staten Island, N. Y.

Flexoid Eight-Speed Control Unit

A Flexoid Eight-Speed Control Unit for use in motorizing machine tools is announced by The Smith Power Transmission Co., 410 Lakeside Ave., N. W., Cleveland, Ohio. The unit is ruggedly constructed so as to give efficient and trouble-free operation. The housing is of heavy cast iron, and the shafts and gears are of alloy hardened steel. Shafts are one piece and are solidly mounted at each end in SKF ball bearings. No pilot bearings or bronze bushings are used in the unit. All gears and bearings operate in a continuous bath of oil which is said to ensure smooth, vibration-free operation in any speed ratio without excessive wear.

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•NEW ABRASIVE BAND GRINDER..

"Built Like a Machine Tool"

The Hormel-M Grinder is sturdily built with a supporting leg under the grinding table to eliminate vibration and tipping due to pressure on the belt. Ball bearing throughout. Equipped with ALEMITE LUBRICATION complete with grease gun.

Write for illustrated folder on this and other styles and sizes.

HORMEL-M GRINDER

WALLS SALES CORP.
96 WARREN ST. NEW YORK, N. Y.



CONTINUOUS HINGES



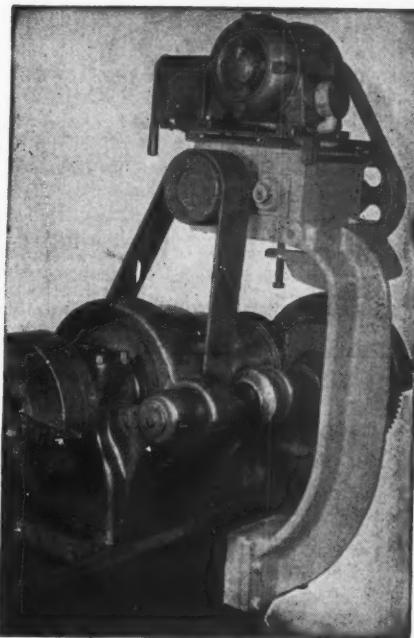
Manufactured by

AUTO MOULDING & MFG. CO.

2326 S. CANAL ST. CHICAGO

WRITE FOR STOCK LIST

MOTORIZATION DRIVES



(Fig. 198)

Type 1136—5 H.P. 4 Speed Gear Box

No one drive meets all requirements advantageously.

Be sure to choose the correct type for your application.

We offer:

V Belt Drives

Gear Motor Drives

4 Speed, Gear Box Drives.

Send us a list of your requirements and get unbiased recommendations.

PRODUCTION EQUIPMENT CO.
5219 CHESTER AVE. CLEVELAND, OHIO

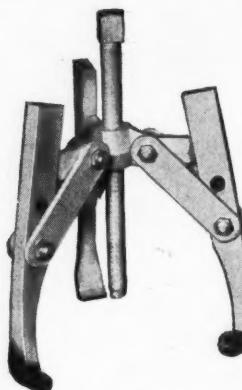
Standard ratios of the Flexoid Eight-Speed Control Unit are: 1 to 1, $1\frac{1}{2}$ to 1, 2 to 1, $2\frac{1}{2}$ to 1, 3 to 1, $3\frac{1}{4}$ to 1, 5 to 1, and $7\frac{1}{2}$ to 1. Due to a patented double cam construction, all eight ratios are controlled through a single handwheel with a neutral position between each one. The handwheel may be mounted at either end of the unit or be replaced by a remote control. The input and output shafts may be direct connected or driven by V-belt, flat belt, or chain.

OTC Three-Jaw Gripomatic Pullers

A series of three-jaw Gripomatic pullers incorporating the OTC patented pulling principle is announced by the Owatonna Tool Co., 357 Cedar St., Owatonna, Minn. The pullers are available in three sizes and are essential in installing and removing workpieces on which OTC two-jaw pullers cannot be properly centered or applied such as gears, pulleys, and wheel having 3, 5, or 6 spokes. Parts for the three-jaw pullers are interchangeable with those of the two-jaw type puller, which en-

ables the user to obtain the advantage of both type pullers.

Each size OTC Three-Jaw Gripomatic Puller is available with two sets of jaws having a variation in reach. In



OTC Three-Jaw Gripomatic Puller

addition, the new OTC Power-Pitch thread which is said to enable pullers to be more efficiently applied is also employed on the three-jaw units.

New Nesting Type Tote Pans



Lots of 50
\$1.00 each

20" long x 12" wide x 6 1/2" deep.
16 ga., drag holes and handles both ends.

Lots of 100 & 200 less 3%; 300 up less 5%

J. L. LUCAS & SON, INC.
1 Fox Street Bridgeport, Conn.

Ideal No. 13 "Universal" Electric Etcher

Enclosure of all parts for safety is the outstanding feature of the portable No. 13 "Universal" Electric Etcher announced by the Ideal Commutator Dresser Co., 1031 Park Ave., Sycamore, Ill. The etcher tool and cords, switch, and indicator lamp are all under cover. Small objects are etched right on the



MACHINE TOOL GRINDERS

Type BPA Precision Internal-External Grinders. For Lathe, Planer, etc. Sizes: $\frac{1}{4}$ H.P. to 10 H.P. Grind internally up to 24" deep.

Type PAV Vertical Spindle Grinders for Planer or Boring Mill. Sizes: $\frac{1}{2}$ H.P. to 10 H.P.

Write for details on above or Complete Catalog on Grinders, Buffing and Polishing Machines. Sizes: $\frac{1}{4}$ H.P. to 25 H.P.



Type BPA

The STANDARD ELECTRICAL TOOL Co.

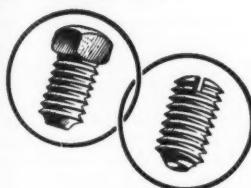
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Cincinnati, Ohio



Type PAV

MOORE'S



SMALL
SET SCREWS

Headless to $\frac{1}{2}$ -13—
Square Heads to
 $\frac{3}{8}$ -16 and Dardelet

PIPE PLUGS: $\frac{1}{8}$ " and $\frac{1}{4}$ " Headless,
Square Heads and Hollow Heads.

GEORGE W. MOORE

44 Farnsworth St., Boston, Mass.

For 60 Years Mfgrs. of Quality Screws

SPEED UP NATIONAL DEFENSE
with KENNAMETAL TOOLS

Scores of plants producing airplane parts, tanks, guns, shells and other armaments are now speeding up production with KENNAMETAL speed tools. Wright Aeronautical Corp., for example, specify KENNAMETAL on most steel cutting jobs in their Paterson, N. J., plant.

KENNAMETAL is also reducing machining time of parts for trucks, tractors, railroad cars, locomotives and other auxiliary equipment so vital to National Defense.

Let us show you how KENNAMETAL can increase your production of hard steel parts from 30 to 50%—with no additions to your present machine tool investment. There is no obligation—write today.



INTEGRITY!

T R & S Rivets are the last word in dependability and uniformity. And they're backed by the long-established integrity of the Tubular Rivet and Stud Company. So remember — for complete confidence in your production charts — specify only T R & S Rivets.

TUBULAR RIVET & STUD CO.

*World's Largest Manufacturer of Tubular
and Split Rivets*

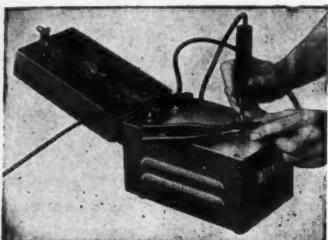
WOLLASTON,

MASSACHUSETTS



work plate which makes up part of the case, while a ground clamp is furnished for larger objects. The cover is removable if desired.

Etching heats are 120, 240, 420 and



Ideal No. 13 "Universal" Electric Etcher

700 watts; a red indicator lamp burns brighter as the hotter heats are turned on. Writing is said to be as easy as with a pencil, yet the marking is clearly and permanently burned into the metal. The standard unit is for 110 volt, 60 cycle, a.c. current. Other voltages and frequencies are available. Overall size is $7\frac{1}{4} \times 5\frac{1}{8} \times 8\frac{1}{2}$ in. Weight, complete, 16 pounds.

COMPOUND DIES

Produce Accurate Parts in One Operation



AROH TYPE

Waltham Machine Works
Waltham • Massachusetts

They are most satisfactory when used in WALTHAM CYLINDRICAL SUBPRESSES where accurate alignment is not only attained but maintained. We can furnish these Subpresses in nine diameters of plungers. The arch type is used for strip punching with or without roll feed. Use the overhang type for second operation work requiring hand positioning.

Knu-Kam-Klamp

Illustrated herewith is the Knu-Kam-Klamp which is now being marketed by Knu-Vise Incorporated, 16839 Hamilton Ave., Detroit, Mich. The Knu-Kam-Klamp is made in two sizes, both of which are interchangeable with the standard type No. 110 and No. 250 toggle clamps. The action of the tool is similar to that of a toggle clamp insofar as they both have a clamping bar hinged at one end, an operating handle, and a base member for attaching same to fixture. The link connecting the handle to the toggle bar is slotted so as to permit the toggle bar to be rapidly withdrawn from the work, the link performing no actual part in the clamp.



Knu-Kam-Klamp

ing operation. The upper portion of the toggle or clamping bar is machined to a cam surface against which two rollers are in contact at all times. When the handle is in a vertical position, these rollers contact the low part of the cam surface and the toggle bar is in the maximum position to take the thickest

SCHAUER Speed Lathes



2 Speed Motor. Automatic Brake. Collet or 3 Jaw Chucks. Hand operated or automatic. Write for Circular 380.

SCHAUER MACHINE CO.

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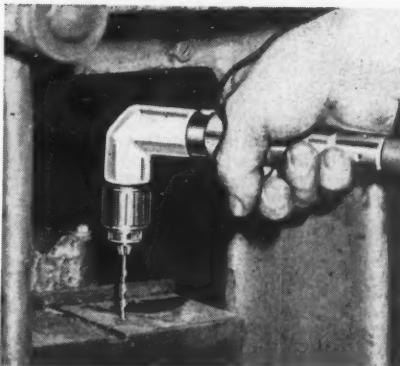
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part being held in the fixture. Continued swinging of the handle forces the cam rollers against the rise of the cam so that the toggle bar is eventually in the minimum clamping position.

Inasmuch as more than one thickness of stock may be clamped at one set-up, the Knu-Kamp-Klamp is applicable to all phases of industry. The adjustment range of the tool is between $\frac{1}{8}$ and 1 in., depending upon the portion of the toggle bar used for clamping.

Stow Angle-Head

A close-corner angle-head for use in drilling and filing with flexible shaft machines has been brought out by the Stow Mfg. Co., Inc., 1 Shear St., Binghamton, N. Y. The compact dimensions of the unit enable it to be used in very confined quarters. The overall dimension from the drill socket to the top of the case is $2\frac{1}{8}$ in., and the distance from the spindle center to the outside of the case is $9/16$ in. The unit has an aluminum housing containing two single-row ball bearings combined with a needle bearing on the horizontal spindle. High thrust capacity and assurance of



Stow Angle-Head

heavy duty performance are said to be outstanding features.

With a chuck that screws onto the vertical spindle, the Stow Angle-Head accommodates drills, rotary files, and so on, up to $\frac{1}{4}$ -in. shanks. For close work, short drills with $\frac{1}{8}$ -in. shanks may be inserted directly into the spindle and held by a set screw.

How much does HEAT-FAG Cost You... and your men?

DOES your plant pay tribute to this unseen force that saps men's energy and lowers efficiency? Heat Fag threatens all workers when body salt sweated out by hot, heavy work is not replaced. Play safe. It's easy and inexpensive to provide salt tablets for workers who sweat. A small investment now will pay big returns when hot days arrive . . . Write for folder: "Heat Fag Among Workers."

**MORTON'S
SALT TABLETS**



Morton's Modern Sanitary Dispenser
Delivers tablets one at a time. Morton's Salt Tablets are made of the most highly refined salt, pressed into convenient tablet form. Easy to take with a drink of water — dissolves in less than 50 seconds after swallowing.

DISPENSER 500 Tablet Size... \$3.25
1000 Tablet Size \$4.00
Case of 9000 10-grain salt tablets \$2.60

MORTON SALT COMPANY CHICAGO, ILLINOIS

Westinghouse Inerteen Capacitor

A water-cooled Inerteen capacitor for high-frequency service on induction furnaces and similar applications is announced by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Capacitor sections are made by winding a special grade of paper with thin copper foil. The foils are bonded on one end to the water tube of the unit so that they conduct heat to the water and

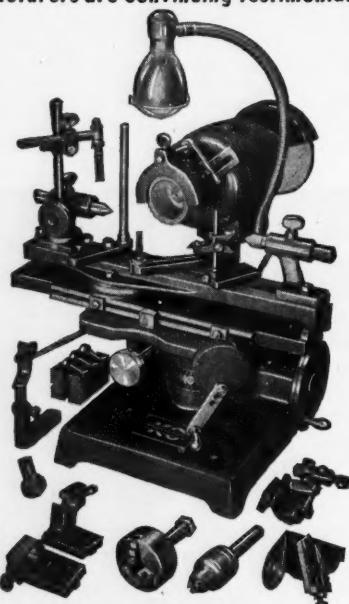


Westinghouse Inerteen Capacitor



Reamer and Cutter Grinder

Repeat orders from prominent manufacturers are convincing testimonials.



A machine in a class by itself.
With this Universal Tool you can do any tool grinding job within its range, including Carbide tools, at a big saving in time.
Ask for bulletin No. TG408M.

K. O. LEE & SON CO.

Aberdeen, So. Dak.

"practical tools for practical men"



carry the current. Leads are brought out at the center, and the ground terminal of each group of sections is located near the ends of the case. The case is of welded construction with a recess at the bottom for use in locating the capacitor on insulators. When the unit has ratings of 5,000 cycles or more, a non-magnetic stainless steel cover is used so as to limit the heat generated in the case.

Inlet and outlet water connections are tapped for $\frac{1}{4}$ -in. standard pipe threads and short tubes are furnished for attaching rubber hose. The complete uni-

T. H. LEWTHWAITE MACHINE CO.

PUNCHES **CUTTERS**

BENDERS

SPECIAL TOOLS

PUNCHES and DIES for round, square and other shaped holes. Catalog sent on request.



317 EAST 47TH ST. • NEW YORK CITY
Wickersham 2-7164



J&H

The Demagnetizer

For Alternating Current

The J & H Demagnetizer requires no countershaft, belts, or other intricate electrical connections. All that is necessary is to plug it into the nearest lamp socket or receptacle.

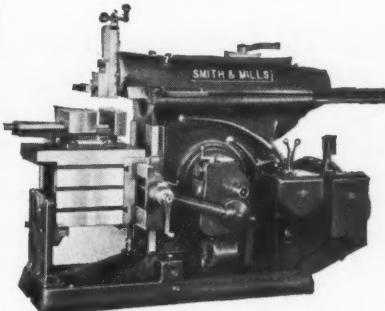
It is of the new Unipole type—heavy duty—and can be supplied for either 110 or 220 volt alternating current. Size 12" long, 9" deep, 6" high. Weight 60 lbs.

Sold On One Week's Trial

J. & H. ELECTRIC CO.

202 Richmond Street, Providence, R. I.

SMITH & MILLS SHAPERS



Automatic lubrication—forced feed. Multiple disc clutch and brake. Quick feed changes. Direct reading feed and stroke dials. Power rapid traverse to cross feeds.

THE SMITH & MILLS CO.
CINCINNATI • OHIO

THE REID POWER-FEED SURFACE GRINDER INCORPORATES SEVERAL EXCLUSIVE FEATURES,

Including:

1. Centralized Control.
2. Convenient Cross Feed Knock-Off.
3. Rapid Table Travel With Chain Drive.
4. Complete Dust Protection
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6. Hydraulic Controlled Reverse Clutch.

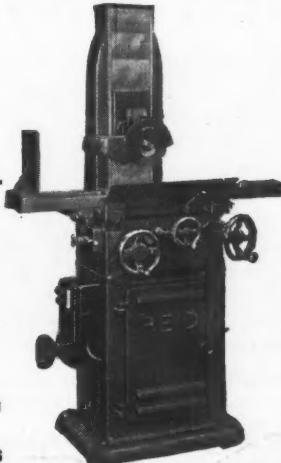
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REID BROTHERS COMPANY, INC.

Beverly

EST. 1900

Massachusetts



is vacuum dried and impregnated and is filled with capacitor-Inerteen—a non-inflammable fluid—which, in combination with the capacitor paper used, is also especially suited as a dielectric for high-frequency applications.

U. S. Oil Lubrication on Horizontal Motor with Oil Gage

U. S. Electric Motors, Inc., Dept. 90, 80 34th St., Brooklyn, N. Y., has developed an oil lubrication system which is

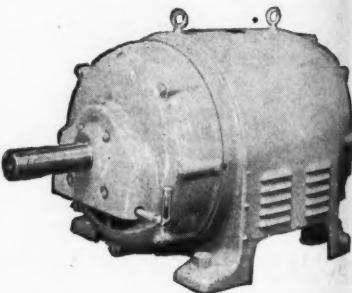


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By a Quick, Easy, Inexpensive Method
Your business letterhead will bring literature.

WATTS BROS. TOOL WORKS
WILMERTING, PA.

now being supplied on all U. S. Open Type SA Motors larger than 30 h.p. 3,600 r.p.m., and on all U. S. Uniclose Type SC Motors larger than 75 h.p. 1,800 r.p.m. A conveniently located

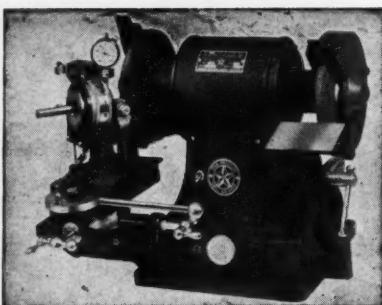


U. S. Oil Lubrication on Horizontal Motor with Oil Gage

simply constructed oil gage is supplied on all oil-lubricated motors. The gage is marked with a maximum and minimum level which can be easily checked. Only a few minutes time is said to be required to check and refill the oilers on the motors.

The use of this oil lubrication system is said to result in a longer bearing life, complete and thorough lubrication being assured at all times inasmuch as the oil level is maintained at a point slightly above the outer race of the bearing. Thus sufficient oil is always present, although the bearing is never overloaded with oil. Consequently, the result is cool operation of the bearing.

Trim Your Drill Costs with a STAR PRECISION DRILL GRINDER



Produces perfect points on drills No. 41 to $\frac{5}{8}$ " inc. Write for Descriptive Folder.

Star Machine & Engineering Corp.
Division Star Electric Motor Co., Bloomfield, N. J.

Johnson Feeder Trucks

The O. Johnson Mfg. Co., Dept. P, 6027 W. Roosevelt Rd., Cicero, Ill., has added two flat top die trucks, to be known as feeder trucks, to its line of "Multiduty" die trucks and "Portable" work benches. The trucks are of sturdy, rigid, electric-welded construction and are made for long and useful service. The simplicity and ease of operation make them useful in tool, die, and machine shops, particularly for transferring, transporting, supporting, and so on. The trucks are also very useful around punch presses.

Johnson Feeder Trucks are made in two sizes designated as Styles F1 and



Johnson Feeder Truck

F-2. Specifications for each style truck are as follows: Style No. F-1, size of table, 28 x 40 in.; table maximum (height from floor), 40 in.; table minimum (height from floor), 24 in.; table (safe load), 3,000 lb.; ball bearing heavy duty casters, rubber cushioned; ship-

ping weight, 400 lbs. Style No. F-2, size of table, 24 x 32 in; table maximum (height from floor), 40 in.; table minimum (height from floor), 24 in.; table (safe load), 2,000 lb.; ball bearing heavy duty casters, rubber cushioned; shipping weight, 325 lb.

Special Wheels for "Problem" Grind- ing Jobs

To meet the need for special grinding wheels for use on unusually difficult grinding jobs, Atlantic Abrasive Corp., 530 Pearl St., South Braintree, Mass., has been organized to provide a highly specialized consulting service and to manufacture the wheels required to meet special grinding problems.

The unusually difficult problems referred to include the grinding of high speed tool steels, soft alloys, rubber and many other materials which because of rapid wear, excessive heating

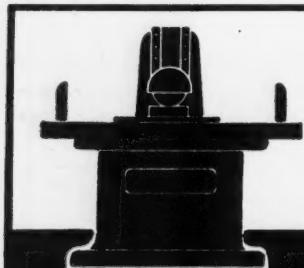
STRAIGHT-CIRCULAR-IRREGULAR CUTTING OF SHEET METAL



BEVERLY cuts flat to any size or shape. Three sizes: No. 1, weighs 16½ lbs., cuts up to 14 gauge. No. 2, weighs 32 lbs., cuts up to 10 gauge. No. 3, weighs 55 lbs., cuts up to $\frac{3}{8}$ gauge. Write for circulars and prices.

BEVERLY
Throatless Shear Co.
3004 W. 111th St.
Chicago • Illinois

G E A R S
Good Gears Only
All Kinds
Any Quantity
AT THE RIGHT PRICE
THE CINCINNATI GEAR CO.
1825 Reading Road Cincinnati, Ohio



ABRASIVE Surface Grinders

QUALITY • ACCURACY • DURABILITY • ECONOMY
WRITE FOR PARTICULARS

ABRASIVE MACHINE TOOL CO.

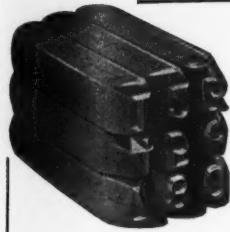
EAST PROVIDENCE, R. I.

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MARKING TIME

When it's marking time in your shop—mark with THOR STAMPS. They're made of correctly-heated alloy steel to give you more marks per dollar. Central striking point gives uniform indentation. Thumb side marking makes them easily read—easily used.

Write for catalog.

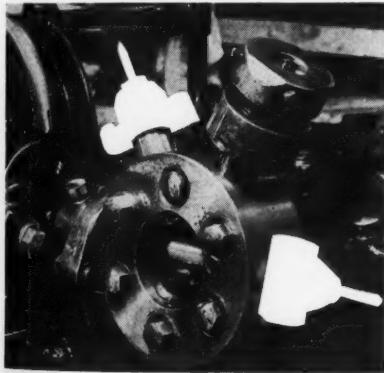
The Pittsburgh Stamp Co.
812 CANAL ST. • PITTSBURGH, PA.

NAILS • RIVETS • SCREWS
MADE TO ORDER IN ANY METAL

HASSALL Products
CLAY & OAKLAND STS.
BROOKLYN, N.Y.

CATALOG
WILL BE
READY
SOON

Write for
Illustrated Catalog



You too
can fit these
into your
Production
Picture

They'll reduce your production costs. They'll speed up your output. They'll improve the quality of your finished product. Whether your requirements are for Drill Chucks, Tap Holders, or Die Holders; whether your

screw machines are old ones or new ones, it's all the same when you use ALCO Tools. The exclusive floating feature enables you to count on perfect threads or perfect holes. Absolute concentricity is easily and quickly attainable—with a minimum of set-up time. The adjustment is simple, yet positive. And, since ALCO Drill Chucks and ALCO Tap Holders are usable *without bushings*, you avoid bushing headaches and wipe out expensive bushing inventories. These points alone should prompt you to write today for complete information. The Alco

Tool Co., 835 Housatonic Ave., Bridgeport, Conn., U. S. A.



ALCO EFFICIENT **TOOLS**

or quick loading of the grinding wheels have become serious problems for the production executives.

The factors involved in the selection of a grinding wheel are, according to Atlantic Abrasive Corp., proper size, shape, weight, bond, temper of the wheel, and coarseness or fineness of the grit. Atlantic is said to employ a patented synthetic bond which completely eliminates clogging, glazing and overheating, and which is particularly valuable on such jobs as grinding or buffing rubber, leather, fibre, and so on.

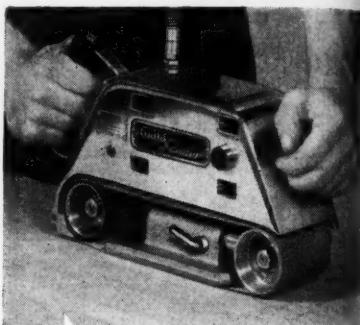
The Atlantic line includes plain and combination wheels in a full range of sizes and grits for such jobs as those listed above, as well as cut off wheels, cones, sticks, and special wheels for special purposes.

Type G-3 GuildSander

The Syracuse GuildTool Co., Syracuse, N. Y., announces the addition of a portable electric sander using standard 3 x 24-in. abrasive belts to its line of products. With a belt speed of 1,350 ft. per minute, this tool, designated as the Type G-3 GuildSander, is said to speed up sanding and surfacing operations on wood, metal, marble, slate, plastics, and other composition materials. It is equipped with a $\frac{1}{2}$ h.p. universal motor and can be operated on any 110 volt a.c. or d.c. line. The sander can also be supplied for other voltage requirements.

The Type G-3 GuildSander is balanced, compactly built, and easy to handle. All moving parts, including the drive and idler pulleys, are equipped with precision ball bearings. A patented belt aligning control on the sander is said to ensure perfect belt traction regardless of motion used. In addition, the sander features a patented quick belt change latch which, it is claimed, cannot stick.

Light in weight (15 lbs.), the Type G-3 is said to operate efficiently on both bench and holding jobs as well as on



Type G-3 GuildSander

new work or in removing old finishes interior or exterior. The frame is sturdy cast of aluminum alloy and has a highly polished mirror-like finish.

Polymatic Single Spindle Screw Machine

To fill the need for a small capacity, high speed precision screw machine of simple and flexible design for the manufacture of the small parts used in electrical appliances, clocks, watches, sewing machines, business machines, and so on, Unit Machinery Co., Rockford, Ill., has brought out the Polymatic Single Spindle Screw Machine illustrated herewith.

The feature of the machine is its small size, space of only 10 x 30 in. being required, exclusive of the stock tube. Maximum capacity is 5/32-in. round stock. The machine is available either

LOWER LAPPING COSTS

COPPERHEAD LAP cost less than making your own to suit individual jobs. They last indefinitely because of patented Replaceable COPPER SLEEVES.

Complete stocks of all sizes from $\frac{1}{8}$ " to $2\frac{1}{2}$ " available for quick shipment.

BOYAR - SCHULTZ CORPORATION

2120 WALNUT STREET
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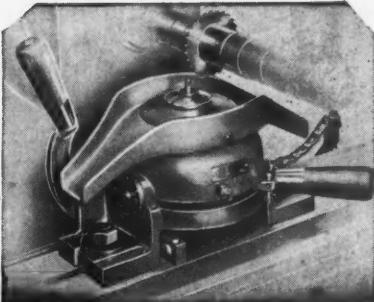
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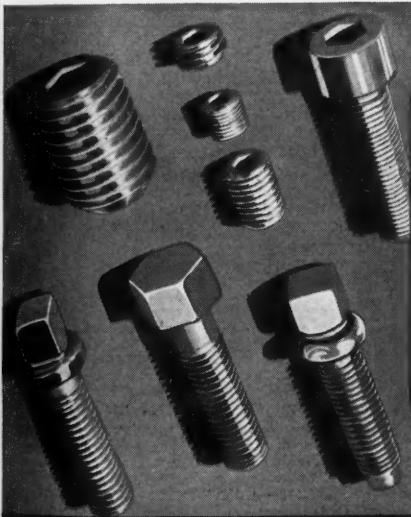


DEARBORN Automatic Chucking and Indexing Fixture

MILLS OVER 1000 PARTS PER HOUR

Work held by draw in collets. Collets open and close automatically. Work automatically ejected. Indexes without loss of time for milling 1, 2, 3, 4, 6, 8, 12 or 24 sided pieces. Minimum set-up time required. Speeds up production. Positive and accurate in operation.

J. W. DEARBORN
70 S. CLIFF ST. • ANSONIA, CONN.



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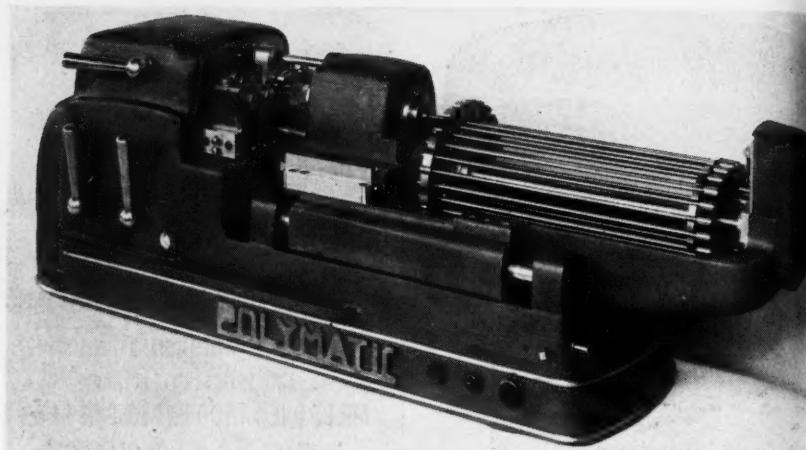
Where else can you obtain 16 different kinds of heat-treated, alloy steel screws—all standard? Or any other type made to your specifications, and with Mac-it's quarter century of experience in making top quality products?

Mac-it's are the only complete line of heat-treated alloy steel screws on the market. And they're Good!

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THE STRONG, CARLISLE & HAMMOND COMPANY
1393 West Third St., Cleveland • Ohio



Polymatic Single Spindle Screw Machine

in bench or floor-mounted model and the flexibility and ease of set-up fully meets the requirements of general screw products work where changes are frequent as well as on high production, long run work employing special single purpose tools.

Maximum spindle speed is 15,000 r.p.m. High precision manufacture and anti-friction bearing construction ensures freedom from vibration at these high speeds. Production cycle time may be varied from one-half second per piece for simple parts up to five seconds for more intricate work. Length of stock feed is positively adjustable from 1/16 to 1 in. for one movement of the feeding mechanism but extra long strokes may be obtained with a special attachment. The r.p.m. of the spindle can be changed in fine steps from 3500 r.p.m. to 15,000 r.p.m. by means of two pick-off

gears which are easily accessible. A push-out type collet is used, the tension adjustment of which is simple and easily accessible. The feed tube and feed finger assembly can be removed in a few seconds through the rear end of the main housing.

The forming and cut-off tool slides have individual feed cams and each slide has an accurate positioning device for adjustment in setting up. An adjustable positive stop on each slide ensures accuracy in forming work. A fully adjustable circular tool holder mounted on each slide is standard equipment.

The turret tool slide has four tool holes; one normally for the stock stop and the other three for other turret tools. When using taps or dies, a threading attachment is mounted in the base of the machine. Lubrication is of the



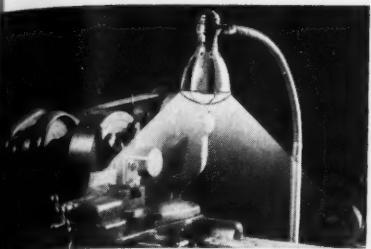
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43 SIZES FROM 1/50 TO 10 H.P.
Speeds from .0083 to 1140 r.p.m.

The diversity of Janette motorized and motorless reducers enables you to select the style of compact, rugged speed reducers to exactly meet your individual requirements. May we give you complete information.

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SPOT LIGHTING Speeds Up Production

The VIMCOLIGHT'S flexibility focuses non-glare, high intensity light on any job. It reduces fatigue from eye strain and results in greater machine capacity with less risk of injury. Vimco has produced a complete line of general machine lights for 20 years. They are easily attached to any machine.

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SPEED VISE

Saves Time



Instantly adjustable to
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3", 4" and 6" sizes

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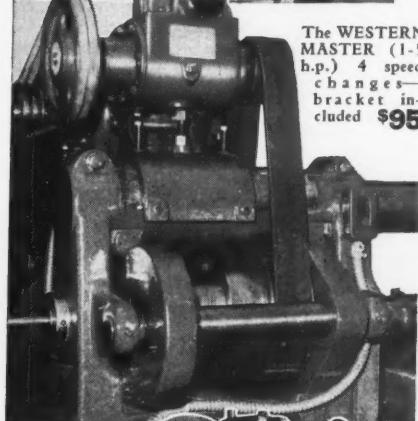
GLENDALE, CALIFORNIA

MODERNIZE

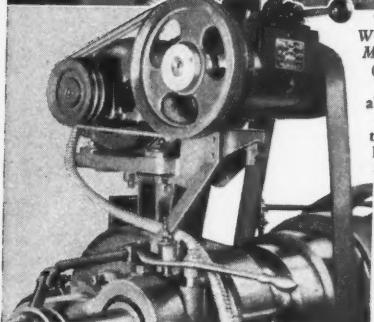
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MASTER (1-5
h.p.) makes 4
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available on shap-
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included \$95



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combination splash and pressure type and is fully automatic. All oil is filtered before reaching the lubricant distribution system.

Standard equipment includes the motor base, two pulleys and driving belt, silent stock support, set of cam planks, one set of spindle speed pick-off gears, one set of feed pick-off gears, wrenches, and chip guard. Weights: pedestal type, without motor, 950 lb.; with motor, 1100 lb. Bench type, without motor, 600 lb.; with motor, 750 pounds.

Yale & Towne "Translifter" Hand Lift Truck

The illustration presents the "Translifter," a hand lift truck manufactured by The Yale & Towne Mfg. Co., Philadelphia, Pa., and designed to handle heavier loads with less effort. Providing a positive mechanical selective (pump action) lift, the truck features effortless pump handle operation. The handle, designed with an eye to the safety of the operator, has a lower flush-welded grip with no projecting edges.

Made in capacities from 3,500 to 5,000



Yale & Towne "Translifter" Hand Lift Truck

lb., the "Translifter" is available in either wide or narrow frame models. Both types have the same devices for load safety, and both feature hydraulic release checks to prevent dropped load and torsion-type rear links for side sway elimination. Designed for use with skid platforms, this hand lift truck lends itself to the carrying of all sorts of heavy items.

SAVAGE NIBBLING MACHINES **Powerful Direct-Over-Center Drive** **Totally Enclosed Revolving Head**

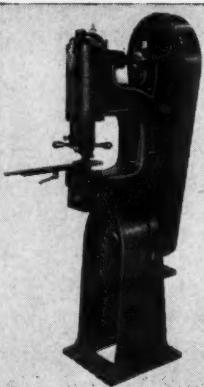
CAUTION!

Where excessive heat and open flame are dangerous, or injurious to the metal being cut, the Savage Nibbling Machine meets the requirement.

Capacities to $\frac{7}{8}$ ".

Throat depth to 36".

Ask for Bulletin "E" 1940



W. J. SAVAGE COMPANY
KNOXVILLE Since 1885 TENNESSEE
Pioneer Manufacturers of Nibbling Machines

Cleveland Tilting Box Grab and Tramrail Carrier

The Cleveland Tramrail Division of The Cleveland Crane & Engineering Company, Wickliffe, Ohio, has developed a tilting box grab and tramrail carrier that picks boxes up, sets them down, or empties them by tilting, all operations being manipulated by means of controllers in the cab.

The equipment consists of a cab-operated Cleveland Tramrail motor-driven carrier with two independent hoisting units and motorized grab. The hoisting units make it possible to raise or lower boxes as desired and empty them as fast or as slowly as may be required.

The boxes used with the grab are provided with four suspension brackets, two on each side as seen in the illustration. Motor-driven sliding latch bars in the grab may be extended into or retracted from the suspension brackets by the operator in the cab. In opera-

*Quicker assembly...
Lower cost with*

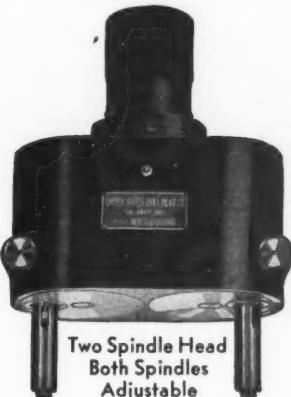
WHITNEY Woodruff KEYS



• Whitney keys are easily fitted — because they're accurately made. That means time-saving, money-saving assembly of shaft and keyed member. Yet Whitney keys reach deep in the shaft, stand greater strain, can't roll over. Write for Catalog V-111 and price list.

The Whitney Chain & Mfg. Co.
HARTFORD • CONNECTICUT

U. S. HEADS
STANDARD SINCE 1915



Two Spindle Head
Both Spindles
Adjustable

The United States Drill Head Co.
1954 Riverside Drive
CINCINNATI, OHIO

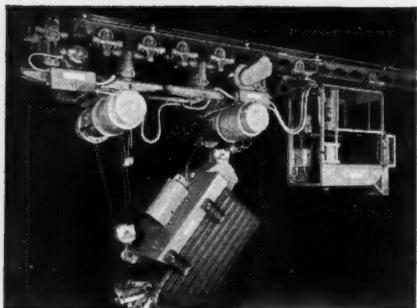
SHEAR-CUT HIGH SPEED END MILLS



Here's a complete line of
Single and Double End Mills.

They save time and money.
Specify **Progressive Shear-Cut End Mills.**
Write for catalog and prices.

PROGRESSIVE TOOL & CUTTER CO.
2345 WOLCOTT ST. FERNDALE, MICH.



Cleveland Tilting Box Grab and Tramrail Carrier

tion, the grab is passed between the suspension brackets and stopped at the proper position by means of the heel of the grab which is brought against the end of the box. Even at distances of 30 or 40 ft. below the carrier, boxes can be picked up or spotted in place easily and quickly by the cab operator. No floor men are required. The suspension brackets make it possible to interlock the boxes, thus facilitating stacking in neat, even tiers.

The unit illustrated was designed for handling three tons, although units of any size up to five tons capacity may be furnished. The carrier travels on arch beam rails at 300 ft. per minute. Tote boxes, spool boxes, and other type containers may be handled with this equipment.

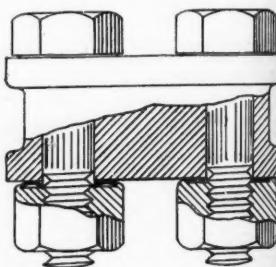
An-cor-lox Lock Nut

A self-contained, one-piece, all metal lock nut has been announced by An-cor-lex Division of Laminated Shim Company, Inc., 64 Union St., Glenbrook,

Conn. The device, to be known as the An-cor-lox Lock Nut, has several distinctive features which make it particularly interesting to builders of machinery of all kinds. It is said to utilize new locking principle that permits effective, positive locking of the nut to the bolt, not to the work.

To apply, the An-cor-lox Lock Nut simply spun on the bolt and drawn to the desired degree of tightness. The nut locks itself automatically to the bolt. The accurate-shaped metal locking ring contained in the bottom of the nut is expanded by the locking pressure into the root of the bolt threads and against the nut rim. This "lock joint" holds securely under all heat conditions and vibration. No special length of bolt is required and the An-cor-lox is well adapted even to short bolts.

It is claimed that the lock nut does not damage the bolt thread or mar the surface of the work, and the same may be used time and time again without loss of efficiency.



An-cor-lox Lock Nut. (Left) In Locking Position. (Right) Locked.

out loss of locking effectiveness. An example of An-cor-lox convenience seen in the fitting and adjustment



Here's how to get real value from your grinding wheels. Dress and true them regularly. Use Vincent Improved Huntingdon dressers equipped with Vincent **high-carbon tool steel cutters**. Your mill supply distributor can supply them, and they cost no more than the ordinary kind.

Insist on the dresser with the aluminum finish.
Write for descriptive catalog sheets.

2424 BELLEVUE AVENUE

THE VINCENT STEEL PROCESS CO. DETROIT, MICHIGAN

Severance GROUND- Govern the World Of ROTARY FILES W H Y ?

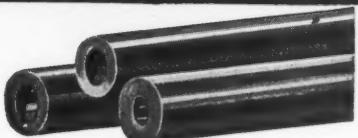
Because Severance originated these cutters—offers the greatest variety of shapes in the widest range of sizes—Maintains the world's largest stock, assuring quickest possible delivery—of both standard and Special Ground M. S. Rotary Files.

Ground Cutters increase production by 50% minimum per hour.

Ground Cutters last three times as long (minimum) as Hand Cut or Mill Cut Rotary Files and can be reground many times.

Write for catalogue No. 12.

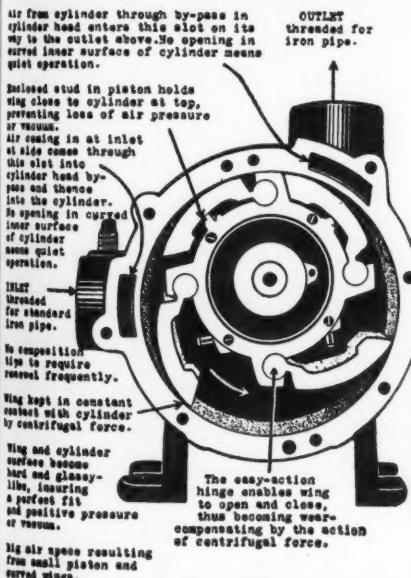
Severance Tool Manufacturing Co.
1516 East Genesee Ave. Saginaw, Mich.



You Save the cost of drilling rings, bushings, etc., when you order BISCO Tool Steel Tubing. The holes are FREE. Sizes up to 14" diameter.

TOOL STEELS • ALLOY STEELS
STAINLESS SHEETS AND BARS

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943 EAST 67th ST., CLEVELAND, OHIO



LEIMAN BROS. PATENTED HIGH PRESSURE BLOWERS AND VACUUM PUMPS GAS BOOSTERS AIR MOTORS

For Gas Furnaces -- Blow
Pipes -- Oil Burners --
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Frames -- Paper Feeding --
Bottle Filling -- All Automatic
Devices.

SENT ON TRIAL!

They Take Up Their Own Wear
LEIMAN BROS. W1H WALKER ST.
Makers of Good Machinery For Fifty Years

bearings and other parts. For the primary set-up, accurate fit can be obtained by merely spinning on the An-cor-lox in reverse position without locking. Then, in the final set-up, the An-cor-lox is turned to its normal position and goes on the bolt for automatic locking.

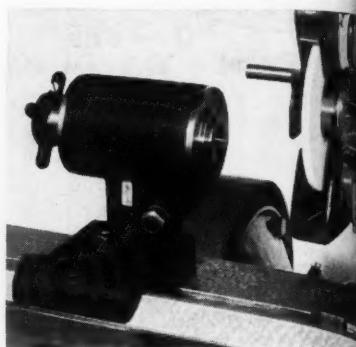
An-cor-lox Nuts are available in all standard sizes and in all metals. They may be obtained packed in standard packages, or in bulk in larger quantities.

B & S No. 10 and No. 13 End Mill Grinding Attachments

A No. 10 and No. 13 End Mill Grinding Attachment for Brown & Sharpe No. 10 and No. 13 Cutter and Tool Grinding Machines respectively are now being manufactured by the Brown & Sharpe Mfg. Co., Providence, R. I. These attachments are said to be of particular value in sharpening the peripheral teeth of steep spiral end mills having straight or taper shanks.

A knob at the rear end of the spin-

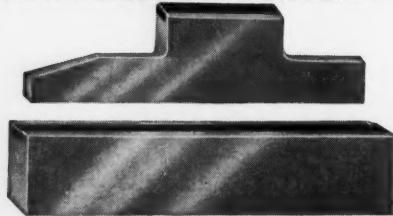
dle of the No. 10 and No. 13 attachments enables the tooth being ground to be easily held in contact with the tooth rest while feeding the cut-



B & S No. 13 End Mill Grinding Attachment

across the wheel by longitudinal table movement. Mounting of the spindle on the attachments on anti-friction bearings provides a sensitive, free-turning unit that is of especial advantage when sharpening very small end mills having a steep spiral.

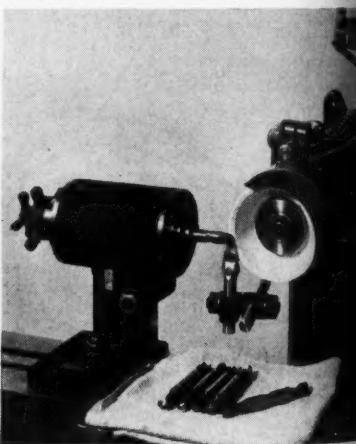
LENGTHEN LIFE OF... CENTERLESS GRINDER BLADES



- 10-30 Times Longer Life
- Reduce Replacement Costs
- Do Not Mark or Score Work
- Improve Accuracy and Efficiency

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TUNGSTEN CARBIDE WEAR STRIPS
Made in Any Length, Shape or Size

METAL CARBIDES CORPORATION
YOUNGSTOWN, OHIO



B & S No. 10 End Mill Grinding Attachment

The spindle of the No. 10 and No. 13 grinding attachments is carried in a body which is supported by and turns

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FOR HEAT SICKNESS

There's A Fairway Service
Fitted to Your Needs

Fairway Laboratories, pioneers in the attack on heat sickness, offer a variety of services to suit every possible emergency.

There are six carefully designed Fairway Dispensers and six different types and sizes of Fairway Tablets, made of pure salt and salt and dextrose, compounded to the approval of leading industrial physicians.

In shop and field, wherever high temperatures exist, workers are subject to heat sickness. And Fairway has perfected a service to fit the conditions.

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THREADWELL TAPS

... Here are the three reasons for Threadwell's "low-cost-per-hole" production records:

1. Careful selection of materials.
2. Close study of modern heat treating.
3. Rigid inspection of each tap before it leaves the plant.

Write for Catalog No. 10

CARBOLOY
DIAMOND DRESSERS
For Dressing All Grinding Wheels

Write for Catalog DR-38
CARBOLOY COMPANY, INC.
11143 E. 8 Mile Road, Detroit, Mich.
Cle.-Clev.-Newark-Phila.-Pitts.-Worcester, Mass.

THREADWELL TAP & DIE CO.
GREENFIELD • **MASS.**

horizontally on a base casting. Two zero lines 180 deg. apart assure proper alignment of the spindle with the table of the machine when sharpening either right-hand or left-hand cutters. The base of the No. 10 attachment is aligned by keys which fit the table T-slot of the particular machine designated for the attachment, while the base of the No. 13 attachment is aligned by means of the scraped inverted V on the table top of the machine for which this attachment is designed.

End mills having a No. 9 B & S taper shank will fit directly into the spindle of both attachments; while cutters having shanks of other B & S tapers, as well as cutters with milling machine standard taper shanks and straight shanks, are accommodated by stock collets and adapters regularly available at extra cost. A draw-in bolt can be furnished for use with spring collets for holding straight shank end mills.

The B & S No. 10 and No. 13 End Mill Grinding Attachments each have an approximate net weight of 3 lbs. and a shipping weight of 6 lbs. Dimensions for shipment of each are 13x7x6 inches.

Sellstrom Welders' Helmet No. 220S

A welder's helmet made of a material that is said to be extremely light in weight and to insulate effectively against heat is announced by the Sellstrom Mfg. Co., 645 N. Aberdeen St., Chicago, Ill. Designated as the No. 220S, the helmet weighs only 15 oz. complete with lens and holder.

The lens holder, which is a Sellstrom Type "AA" make, is of lift-front design, having an outer and inner lens frame. The outer frame contains the

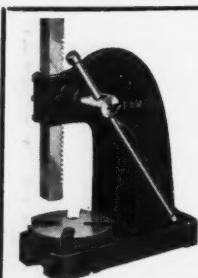
usual dense welding lens and the inner frame, a clear lens or lens of lesser density. The frames are provided with concealed spring hinges which operate



Sellstrom Welders' Helmet No. 220S

within flanges that are integral with the lens holder. These hinges enable the outer lens frame to be easily raised and lowered, thereby providing the user with a quick change from the usual dense lens of the welder to a clear lens and vice versa.

The spring hinges have positive contact when the outer lens is down and hold it firmly in a properly raised position when the secondary lens is being



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Bench and Floor Models

A stock size and model for most every need, or a special press for your special requirements.

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OTC GRIPOMATIC PULLERS

for PLANT MAINTENANCE CAPACITIES—5 to 50 TONS

Patented grip prevents slipping. avoids damage, eases work in close quarters. Alloy steel — guaranteed.

OTC PULLING SYSTEM

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SPECIAL PULLERS

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OWATONNA TOOL CO.

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Free Cutting!
Non-Glazing!
Abuse Proof!



New WTTCo Diamond Impregnated WHEEL DRESSER

Whole, faceted diamonds of high quality and extreme toughness are spaced regularly throughout the matrix to give great accuracy, uniform dressings and to hold wheel to size. These stones are anchored permanently in their matrix by strong chemical bonds that will not break under heat, pressure or rough abuse. No remounting! Lowered costs! After tool is put in machine it will give best results if left in original position. It is not necessary to turn or alter the area in contact with the grinding wheel.

Send for literature and prices.

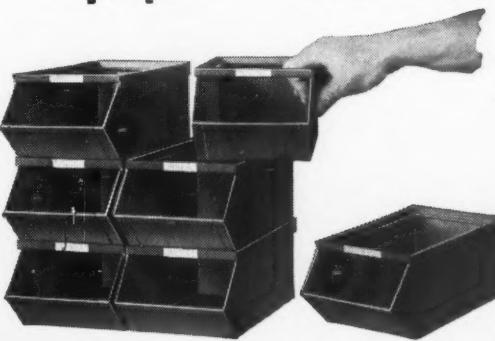
WHEEL TRUEING TOOL CO., INC.
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Hundreds of plants report savings that mean lowered costs—increased efficiency—bigger profits. Compact, sturdy Stackbins increase storage capacity, keep small parts and loose materials instantly accessible, have full-width hopper fronts and smooth interiors to speed up handling and cleaning.



Try individual Stackbins (patented), to solve your problems of handling and storing parts and materials. Write us for full details and low prices. Stackbin Corp., 53 Troy St., Providence, R. I.

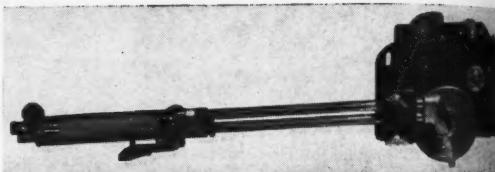
STACKBINS
"STACKED AND STILL ACCESSIBLE"

used. The Type "AA" holder is fastened to the helmet by means of two screws which can be easily removed, thus making the holder interchangeable.

"The Welder's Helper" Portable Cutting Machine

A portable cutting machine to be known as "The Welder's Helper" has been brought out by the Motor Torch Mfg. Co., P. O. Box 1571, Beaumont, Texas. The machine is a self-contained power unit which requires no electrical connections and is designed to fit all makes of torches. Speed of the unit is variable for both light and heavy plate. The machine can be used to cut straight lines, bevels, and curves in all positions, and no jigs or fixtures are required to start or finish cut on plate edge.

The Welder's Helper Portable Cutting Machine is 7½ in. long, 3 in. wide, 7 in.



"The Welder's Helper" Portable Cutting Machine

high, and weighs 7 lbs. It is designed to cut bevels from 0 to 180 deg. and has a vertical adjustment of 4 inches.

Stackbin Machinist's Bench

All-welded steel construction gives the machinist's bench, illustrated herewith and made by Stackbin Corp., 53 Troy St., Providence, R. I., lifelong rigidity.



Stackbin Machinist's Bench

Specify CIRCLE "R" Saws



TRADE-MARK



CIRCLE "R" Saws are made in both high speed and carbon steel, from ¼" to 10" diameter. Prompt delivery on all standard or special saws. Write for catalog.

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SYRACUSE PITTSBURGH
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without periodic tightening. It was originally designed to be used alongside machines in the plant of a bearing manufacturer.

The top is of ½-in. steel, the shelves of 14-gauge steel, and the legs of heavy angle steel. The bench is finished in baked-on, machine gray enamel, and can be equipped with a lock drawer.

**Accurate Hole Transfer Made Easy With
NIELSEN TRANSFER SCREWS**



Simply insert in holes, invert, strike sharply and you have centers and drill circles perfectly located. Reduce time and eliminate spoilage of other methods. 7 sizes U.S.S. Inexpensive — Last for years.

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**NIELSEN TOOL &
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**"CHAMPION"
Steel Racks**

Save time, steps and money by keeping bar stock, shafting and pipe out of the way and off the floor.

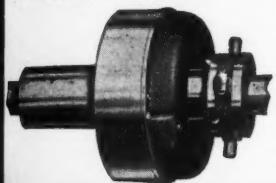
Write for full details.

**THE WESTERN
TOOL & MFG. CO.**
Springfield, Ohio



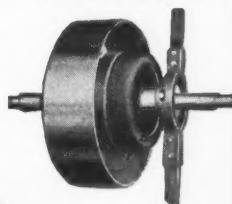
"EDGEMONT" SERVICE TESTED **FRICITION CLUTCHES**

EXPANDING "TYPE B"



Every factory has clutch jobs where the Edgemont "Type B" is the ideal clutch. For countershaft, line-shaft, and many other applications, this clutch will do the work with utmost satisfaction.

Catalogue sent on request.

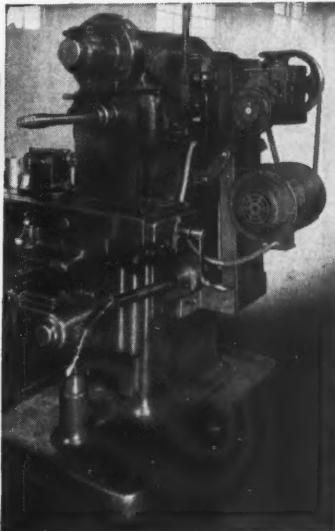


The Edgemont Machine Co.
2100 HOME AVENUE
DAYTON, OHIO

Modernize with
**FLEXOID SPEED
CONTROL**

**REVOLUTIONARY FOUR AND
EIGHT SPEED TRANSMISSIONS**

The Flexoid 4 and 8 Speed Control Units will give your present line shaft driven machines all the advantages of new individually driven machines. Units are sturdy, compact and foolproof, with adjustments provided for V-belt and flat belt drives. A single handwheel control (at a remote position if desired) changes all speeds. All gears and shafts are alloy hardened steel, running in S.K.F. ball bearings. No pilot bearings or bronze bushings to wear out. Write for descriptive data and prices.



The Smith Power Transmission Co.

1545 EAST 23rd ST., CLEVELAND, OHIO

desired. The model illustrated has a 20 x 24-in. top and is 30 in. high, but the bench can be furnished in any size.

Sierra Flashlight Bulb Extension

To meet the need of machinists and tool operators for a closely spotted light in hard-to-see places, the Sierra Aircraft Co., Sierra Madre, Cal., has developed the flashlight bulb extension shown in the illustration. The extension is said to enter openings as small as $\frac{1}{8}$ -in. diameter and to bring light directly to objects even in restricted locations such as inside of gear trains, equipment tanks, motors, under machines, around corners, and so on. By suitably bending, illumination is directible where desired even with the flashlight laid down and the hands otherwise utilized.

The Sierra Flashlight Bulb Extension is made of special wire encased in a high-grade aluminum alloy tubing and is supplied in lengths of from 6 to 36 in. The extension has a plug which is designed to screw into any flashlight with a bulb in the opposite socket. The ex-



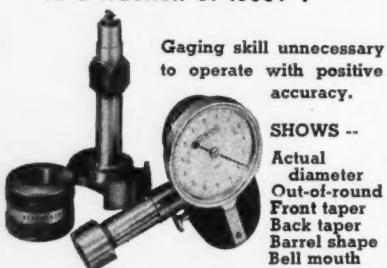
Using a Sierra Flashlight Bulb Extension in Close Quarters

tension is immersible in liquids, can be sterilized, and is readily insulated with tape for work around electrical currents.

According to the manufacturer, the Sierra Flashlight Bulb Extension is excellent for inspection under liquids. In addition, the extension is said to eliminate hazards during inspection of various equipment and machinery which have been rendered dangerous due to presence of heat, chemicals, or parts in motion.

COMTORPLUG

a MEASURING instrument
showing actual size of bores
to a fraction of .0001".



Widely used on ordnance, airplane, ball bearing housing and all precision work—at the machine—at the inspection bench.

REQUEST BULLETIN 27

THE **COMTOR** CO.
WALTHAM, MASS.

EST. 1928

"Drawalloy" Welding Electrode

A welding electrode for draw die, to be known as "Drawalloy," has been added to the regular line of Eureka steel electrodes marketed by the Welding Equipment & Supply Co., 2720 Grand Blvd., Detroit, Mich. The electrode is readily applicable in the repair of all types of used cast iron or medium hard steel drawing and forming dies. It is recommended for use on new construction to meet the unusual welding conditions that exist on sharp contours such as character lines, lines, sharp radii, and so on, or where the average base metal does not hold up under these wearing conditions. The electrode is especially adaptable on very sharp drawing or forming contours which require a weld deposit resis-

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on barrels, kegs,
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shelving, etc. We
design for serv-
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CLEVELAND OHIO

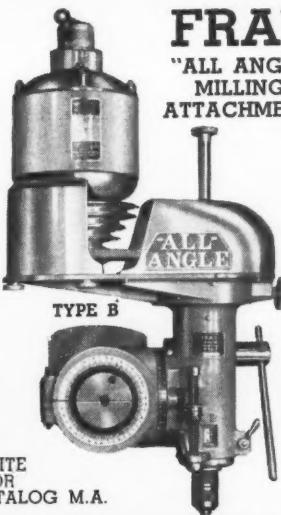


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8130 Jos. Campau Ave. • Detroit, Michigan

FRAY

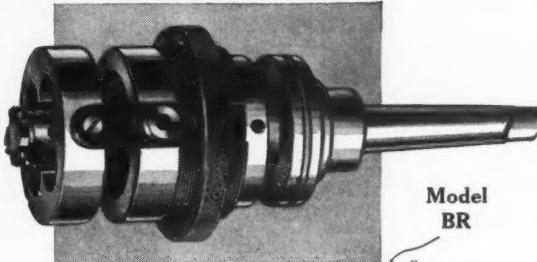
"ALL ANGLE"
MILLING
ATTACHMENTS



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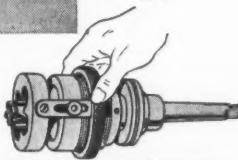
FRAY MACHINE TOOL CO.
GLENDALE, CALIF.

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COLLAPSIBLE
TAP . . .



Turn the ring for micrometer adjustment of
the trip collar—it's fast and accurate on set-
up—no "cut and try."

Revolving or Stationary—all sizes. Chasers
to tap anything from soft brass to forged steel. Fast delivery—
attractive price. Try one at our risk.



The **RICKERT-SHAFER Co.**, Erie, Penna.

Specialists in ACCURATE THREADING at GUARANTEED LOW COST
Die Heads ~ Taps ~ Chasers ~ Boring Heads ~ Threading, Tapping and Cut-Off Machines

wear, metal pick up, and frictional heat set up in drawing operations.

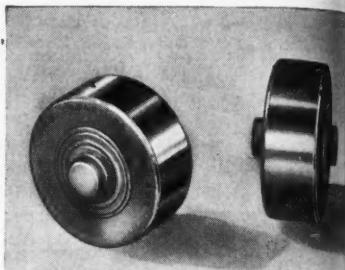
The depositions made with Drawalloy are said to be highly resistant to metal pick up, being austenitic or non-magnetic. The deposits are medium hard, 240-260 Brinell, as welded and work-harden in use. Drawalloy also takes an exceedingly high polish, a feature which is said to be beneficial in all drawing operations, and is furnished in $\frac{3}{8}$, $\frac{5}{8}$, and $\frac{7}{8}$ -in. sizes, 18 in. long. It is supplied packed in 10-lb. containers.

New Departure Treadle Roll Ball Bearing

Because of the relatively short life ordinarily obtained with plain types of treadle rolls in loom service and because of their tendency to jam with lint and damage the cams, New Departure, Division General Motors Corporation, Birstol, Conn., has developed a special treadle roll ball bearing which is said to overcome these difficulties.

Made of high carbon chrome alloy steel, extra heavily built to absorb shock, completely protected from dirt or

lint, and fully lubricated for long life, this bearing is said to practically eliminate shutdowns for roll replacement.



New Departure Treadle Roll Ball Bearing

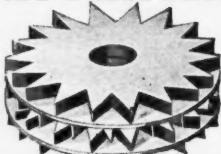
The ball bearing is easy rolling; it can not rub at the sides of the treadle arm and its hard, smoothly finished surface do not become clogged with lint or dirt.

"Fabco" Power Belting

According to the manufacturer, "Fabco" Power Belting shown here is a product of the Fabreeka Products Co., Inc., 222 Summer St., Boston Mass., the first belting priced for genera-

GRINDING WHEEL DRESSERS

We make all types of Dressers and Cutters



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The Canadian Desmond-Stephan Mfg. Co., Ltd.
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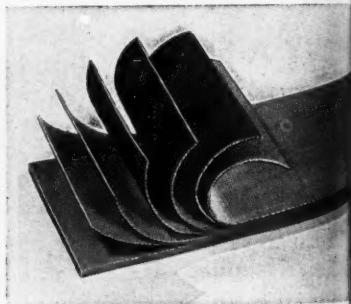
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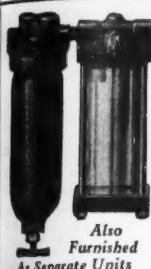
Reading from
Front or Rear

IDEAL TOOL COMPANY
335 Sagamore Drive Rochester, N. Y.



"Fabco" Power Belting

purpose power transmission to offer advantages of a multiple, thin-ply construction. The multiple, thin-ply construction, it is claimed, gives the an extremely high flexing ability, because of this ability to flex readily, Fabco is said to more successfully withstand the severe distortion encountered in passing around pulleys; that is,



Also
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As Separate Units

THE M-B COMBINED AUTOMATIC AIR LINE FILTER AND LUBRICATOR

First removes from 96-97% of water, dirt, scale, etc., in air line, then delivers a mist of oil into the clean air going through the bearings of air tools.

Removes the guess work from the lubrication of air tools, smoothes tool operation, eliminates costly shut downs and lengthens tool life.

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EXPORT OFFICE: 44 WHITEHALL ST., NEW YORK, N. Y., U. S. A.

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The most complete catalog of its kind. Lists 5000 different shapes, sizes and cuts of GROBET Precision Swiss files.

Learn more about these Chrome Steel Files that have won a reputation for utmost precision and durability.

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Direct motor
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available
from 1 h.p.
to 25 h.p.

LIMA STREAMLINED GEARSHIFT DRIVE ELIMINATES COUNTERSHAFTS

\$67.50 LESS
BRACKET

Unit with 3 speeds forward (175, 300, 600) and 1 reverse (160) \$67.50

Unit with 4 speeds reverse (135, 175, 300, 600) \$77.50

Lathe Brackets for above units \$20.00
(Belts, Sheaves and Electrical Equipment
not included)

All steel heat-treated gears — run in a bath of oil. Hand wheel for rotation of machine spindle. Instant reversibility with all speeds. Adaptable for flat or V-belts. Pulley guards are standard equipment on all units. Any standard motor may be used.

Write for further details.

LIMA ELECTRIC MOTOR COMPANY

Division of Lima Armature Works, Inc.
438 N. MAIN ST. LIMA, OHIO

being stretched on the outer surface and compressed on the underside. As a result, the manufacturer points out, Fabco assures long service without pulley or belt take-ups as well as smooth operation and long wear.

Rotor M-825 and M-826 Air Die Grinders

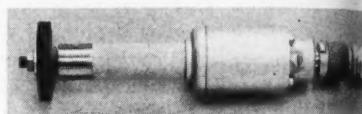
The Rotor Tool Co., Cleveland, Ohio, announces two air die grinders of the production type, designated as the M-825 and M-826, for use with wheels of from $\frac{1}{2}$ to $2\frac{1}{2}$ in. diameter. The M-826 grinder is designed for use in inaccessible places, having a side to center distance of only $19\frac{1}{32}$ in. The unit has a speed of 17,000 or 21,000 r.p.m. and weighs $2\frac{3}{4}$ lbs. The M-825 grinders features an extension of either 13 to 26 in. for use in cleaning up the inside of shells. The side to center clearance of the unit is reduced to $\frac{1}{2}$ in., and the weight is 7 pounds.

Various types of handles such as



Rotor M-825 Air Die Grinder

sleeve twist, spade, button safety, right angle throttle are used interchangeably on both type machines. According to the manufacturer, the motor



Rotor M-826 Air Die Grinder

of both grinders provide ample power for hold-in high load speed for fast cutting and long wheel life.

Ideal BX Armor Cutter

The elimination of nicked wire bending of cable, shorts, and waste BX are the advantages claimed for the Ideal BX Armor Cutter shown here, product of the Ideal Commutator Dresser Co., 1031 Park Ave., Sycamore Ill. The cutter is of a handy pocket



Ideal BX Armor Cutter

size and is easy to use. It is provided with a hardened steel cutting blade which can be removed for sharpening. The jaws are formed to take BX cable of any make, two or three-wire No. 12 or 14. Cable is cut simply by inserting it between the jaws of the cutter and closing them, no adjustments being required.

According to the manufacturer, the Ideal BX Armor Cutter cuts quickly and cleanly without injury to wire insulation.



TANNEWITZ
24" HI-SPEED BAND
SAW

Saws Nearly Everything
Including Wood, Sheet
Steel, Brass and Alumi-
num Casting Gates, etc.
1 1/2" H.P. Direct Motor
Drive.

Also 30"-36"-42" Sizes.
**GRAND RAPIDS,
MICHIGAN**

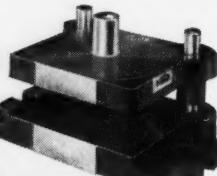
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DANLY
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Precision
Commercial
Special

**Danly Machine
Specialties Inc.**
2430 S. 52 Avenue, Chicago

DANLY DIE MAKERS' SUPPLIES



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—IN THE SMALL RANGE—Spurs, Spurials,
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High precision or commercial production.
Made to order ONLY—No Stock—No Catalog.

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KOEBELITE DIAMOND TOOLS



Deliver a Known
Quantity—and Quality
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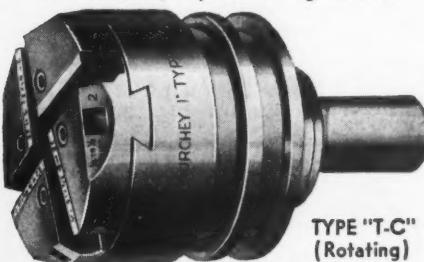
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TYPE
"M"

Collapsible MACHINE TAPS

Universal machine taps used as a
stationary tap with handle or as a
rotating tap by removing handle.



TYPE "T-C"
(Rotating)

(Also in Non-Rotating Type T-G) Tangent Chaser DIE HEADS

Designed to use tangential chasers, these rotating heads will cut
extremely accurate threads on
long production runs.

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MURCHEY MACHINE & TOOL CO.
DETROIT **MICHIGAN**

"ALL STYLES OF BOLT AND
PIPE THREADING MACHINES."

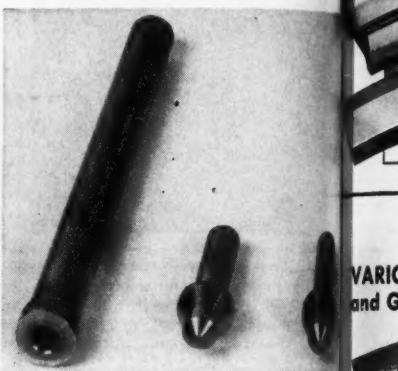
tion and is designed to cut anywhere along a length of cable for opening into outlets, switch boxes, and so on. Net weight, 12 ounces.

Kennametal "Slow Up" Valve

Shown in the illustration is the latest type of Kennametal valve developed by McKenna Metals Co., 300 Lloyd Ave., Latrobe, Pa. Known as a "slow up" valve, it has a small ring of Kennametal inserted in the valve seat, with a cone-shaped piece of Kennametal,

ground and lapped to the same size of chamfer, tipped on the valve. The seat and stem are said to be lapped accurately that they will hold a vacuum.

It is claimed that the Kennametal slow up valve is extremely resistant



Kennametal "Slow Up" Valve



M-D Facing Heads

With Automatic Feed

Can be attached to Column Boring Bar, and Drilling or Milling Machine spindles. Single point tool travels radially, from center outward or reverse, feeds automatically and covers faces 6° to 30°.

Write for circular.

MUMMERT-DIXON CO.
120 PHILADELPHIA ST., HANOVER, PA.

STEVENS ROTARY TABLES STANDARD AND DIAL TYPES



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Four sizes, two types of each.

JOHN B. STEVENS INC.
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Table graduated for single degree reading. Precision and accuracy. Thirty years' experience designing circular attachments.

STAPLES Solid Carboly-Tipped Reamers



Produce up to fifty times as many smooth, accurate holes without resharpening when compared to high speed steel reamers. Their cost is surprisingly low. Write for price schedule. Sold through Carboly Company or direct.

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RAFTS

Tungsten Carbide GAGES



GUARANTEED
PRECISION

Factories: Boston, Chicago, Detroit

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VARIOUS WIDTHS
and GAUGES



BUTTS AND
CONTINUOUS LENGTHS

WRITE FOR PRICES

For
GUARDS
CABINETS
CASES
BOXES

S & S MACHINE WORKS

4541 W. LAKE STREET HARDWARE DIVISION CHICAGO, ILLINOIS



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with
"ROTABIN"
Get to your tools and
supplies quickly

Production demands are greater than ever. Each link in the production chain must be smooth and fast down to the tool or stock room. Sluggish circulation here can form a bottleneck to production.

Make your tools easily accessible with Rotabin. Your tool or stock room will work smoothly and profitably with Rotabin and thus help step up production. Write today. No obligation.

THE FRICK-GALLAGHER MFG. CO., Wellston, Ohio

pre-formed shapes of almost any design for tipping valves and valve seats.

"Time-It" Electric Stop-Watch

An electric stop-watch to be known as the "Time-It" has been placed on the market by the Precision Scientific Co.,



"Time-It" Electric Stop-Watch

1751 N. Springfield Ave., Chicago, Ill. The watch is run by a synchronous electric motor whose speed is precisely controlled by the powerhouse master clock

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Special Reaming Problems Invited
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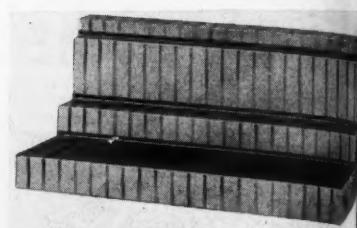
Spiral SPECIALISTS
THE GAMMONS-HOLMAN CO. MANCHESTER, CONN.

which governs the cycle constancy of alternating current. Instead of the ordinary watch dial, the Time-It has a direct reading counter. With this counter time intervals up to 2 hours 46 minutes, or approximately 10,000 seconds, are said to be read directly to 1/10 of a second with the utmost ease. The counter can be reset to zero from any reading. The Time-It Electric Stop-Watch is designed for plugging into any 110-volt a.c. line.

Universal Magne-Blox Angle Iron

The most recent development in the line of Magne-Blox products marketed by George Scherr Company, 130 Lafayette St., New York, N. Y., is the universal Magne-Blox Angle Iron, a useful device for the magnetic chuck design for holding work of all types.

The Magne-Blox Angle Iron consists



Universal Magne-Blox Angle Iron

of a series of steps measuring $\frac{1}{8}$, $\frac{1}{4}$, and $1\frac{1}{8}$ in. in width, upon which may be placed all manner of special pieces for surface grinding without use of complicated clamps and attachments. Overall dimensions are 3 x 1

TRICO OILERS



SAVE TIME—OIL—WORRY

No guesswork—bearing failure—waste—idle machine time—burned motor windings—fire and accident hazards, when you use TRICO OILERS. There's a model for every application.

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TRICO FUSE MFG. CO. Milwaukee, Wisconsin

RACINE
outfit

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1770 ST



MOTORIZ... Speed up!

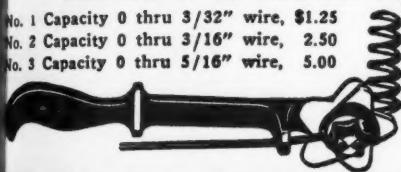
A Remco user writes... "another important feature of Remco Drives is that greater production can be had due to the convenient arrangements for keeping the belt tight and the machines at their production peak" ... Install Remco drives in your plant if you want more output, lower power-cost, increased safety, reduced noise, rent saving from a more compact shop layout. Write Remco Products Corp., State and Hay Sts., York, Pa.

REMCO MOTOR DRIVES

for LATHES, SHAPERS, DRILLS, MILLING MACHINES, etc.

Here's a Real Spring Winder!

No. 1 Capacity 0 thru 3/32" wire, \$1.25
No. 2 Capacity 0 thru 3/16" wire, 2.50
No. 3 Capacity 0 thru 5/16" wire, 5.00

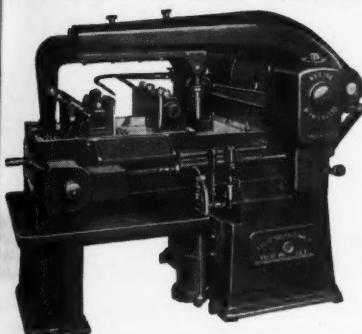


Will Earn Its Cost In One Day
The HJORTH Perfection Spring Winder offers the ideal means of winding extension, compression, torsion, taper, double taper, or left hand springs. Try one in your shop. You'll like it and the price is reasonable.

HJORTH LATHE & TOOL CO. 12 BEACON STREET
WOBBURN - MASS.

RACINE

HIGH SPEED METAL CUTTING MACHINES



RACINE Heavy Duty Hydraulic Series. Fastest cutting for heavy bars, billets, die blocks. Single lever all front control. Capacities 10"x10" up to 14"x20".

For the most economical sawing and for the most rapid production work in large stock the RACINE Heavy Duty Hydraulic Machines are unmatched in the field. On RACINE Hydraulic Saws your metal sawing jobs from the thinnest walled tubing to large die blocks are swiftly and correctly cut due to the accuracy of control over pressure and feed. Such controlled operation gives the maximum in production with the longest blade-life.

The RACINE line offers the correct machine to fit your job—sizes 6" x 6" to 14" x 20" standard or fully automatic types. Send for full details.

"Let RACINE engineer your metal cutting problems."
"Standard the World Over"

RACINE TOOL & MACHINE CO.

1770 STATE STREET

RACINE, WISCONSIN

7½ in. The Magne-Blox Angle Iron is said to simplify the grinding of straight edge sections without the use of clamps and eliminate setting-up time for grinding small pieces. It may be used for grinding all four sides of a square. With the use of a sine-bar or a bevel protractor, work requiring grinding operations at various angles may be laid out and fastened to the side of the angle iron.

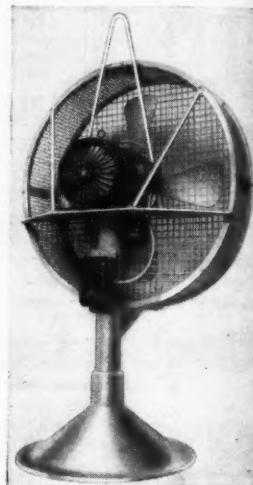
When placed on the plane surface of the magnetic chuck, the Magne-Blox Angle Iron will actually form a magnetic right angle which gives the same holding power per square inch as the chuck itself.

Truflo Man-Cooling Fan

The Truflo Fan Company, 536 Main St., Harmony, Pa., has announced a series of portable man-cooling fans which are available in sizes ranging from 12 to 36 in. in diameter.

The illustration shows a 36-in. man-cooling fan. It is 48 in. high to the center line of the fan wheel, and has a 32-in. diameter cast iron base and 4-in. pipe stand. A special ¾-in. round steel

bar is electrically welded to the base and bolted to the top of the fan for handling with an overhead crane. This fan employs a 3 h.p. motor, cycle a.c. at 1,150 r.p.m. The total weight of the stand, guard and propeller



Truflo 36-In. Man-Cooling Fan

lor, a four-blade solid cast aluminum wheel, is 356 pounds.

In addition to man cooling, the fans may be used for improving working conditions in all types of occupations. The fans are sturdily constructed for hard usage and are so designed that the flow of air does not necessarily blow directly on the worker. Drafts are generated and cool, comfortable working temperatures are maintained, resulting in lowered humidities, improved efficiency, and better working conditions.

FREE CATALOG and Coupling Data

A new book for present and prospective users of flexible couplings. Contains information about the complete line of L-R non-lubricated flexible couplings—types, sizes, selector tables, etc. A free copy is yours for the asking. Write today.



Lovejoy Flexible Coupling Co. 5007 W. LAKE ST. CHICAGO, ILLINOIS

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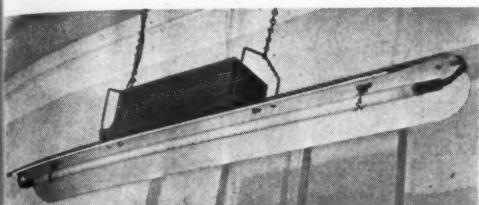


Write for NEW CATALOG—Just Off the Press

CARSON-NEWTON CO.
61-71 MILL ST. • BELLVILLE, OHIO

Westinghouse Type RF White Fluorescent Lamp

An 85-watt, 58-in., Type RF fluorescent lamp which produces white light and is designed especially for industrial



Westinghouse Type RF White Fluorescent Lamp

service has been announced by the Westinghouse Lamp Division, Westinghouse Electric & Mfg. Co., Bloomfield, N. J. The lamp can be operated on either 105 to 125-volt or 210 to 225-volt 60 cycle a. c. circuits in special equipment which provides direct current through the use of a rectifying device. This lamp and the Westinghouse blue-white lamp are interchangeable in size.

gle and twin fixture units available for their use.

Color of the light produced by the Westinghouse Type RF White Fluorescent Lamp is similar to that of the daylight Mazda F (fluorescent) lamp and is suitable for a wide variety of industrial uses, including those where color discrimination is important. Light output of the white fluorescent lamp is approximately the same as that of the blue-white unit which is rated at 4,250 lumens.

Tamms Blue Layout Dope

The Tamms Silica Co., 228 N. LaSalle St., Chicago, Ill., has developed a layout dope, suitable for tool and die-makers' use, which comes in liquid form ready for immediate use. It is blue in color, quick drying, and will not rub off. A line made with a scribe or layout tool is said to be clear and distinct. Known as Tamms Blue Layout Dope, the liquid is economical to use; samples are available.

for rigid joints that
won't loosen

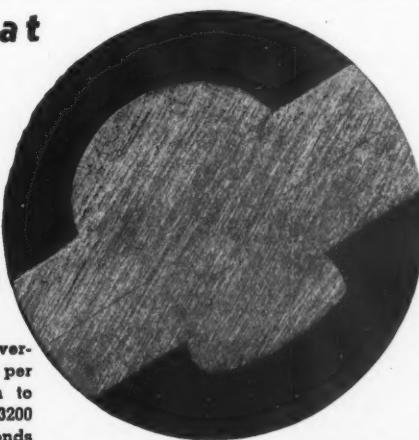
- ✓ a completely
filled hole
- ✓ no flashing
- ✓ a neat,
balanced head



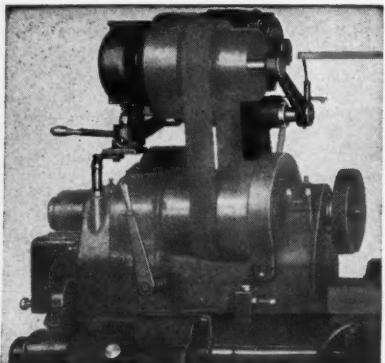
the RIVITOR

ddress THE TOMKINS-JOHNSON CO., 620 N. Mechanic St., Jackson, Michigan

his is a TOMKINS-JOHNSON product



this is a $\frac{1}{4}$ " rivet joint section enlarged.
Send samples of your work to be
"RIVITORed" to this preferred
type of joint.



Modernize Your Machines With **Cullman Drives**

Your Lathes, Shapers, Milling Machines and other belt driven machines can now be easily motorized with direct drives.

Cullman Drives are rigidly constructed, easily installed and simple to operate.

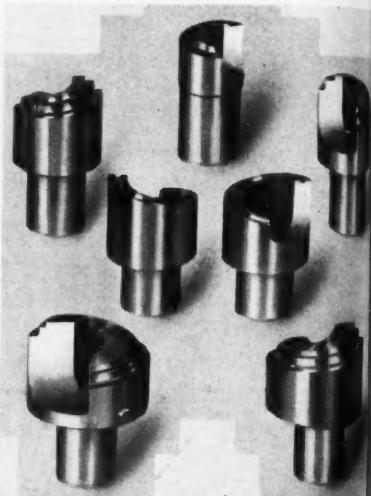
Made for motors from $\frac{1}{4}$ to 15 H.P.

SEND FOR INFORMATION

CULLMAN WHEEL CO.
1336 Altgeld St., Chicago, Ill.

Weldon Single Flute End Cutting Form Tools

Shown in the illustration are a number of form tools of single flute end cutting design, developed by The Weldon Tool Co., 3000 Woodhill Rd., Cleveland, Ohio. The principal feature of the tools consists in that the tools have form ground relief which makes them



Weldon Single Flute End Cutting Form Tools

especially adaptable for use in the turrets of screw machines, in drill presses and similar machines.

Lack of chip room is never a problem with this type of tool, due to the manner in which the tool is designed. Although the tools illustrated have straight and angular shapes, practically any irregular form can be produced in this type of tool. The long life of the tool is a feature not to be overlooked.

"Skin-Foil" Industrial Hand Cream

A protective hand cream for industrial workers, to be known as "Skin-Foil," has been placed on the market by the Cromo Laboratories, Inc., Monroe St., Garfield, N. J. The cream

spreads easily over the skin, providing a film of low surface tension. It is said to remain stable in the presence of most chemical agents and is not transference from the hands to other objects as it dries completely.

The manufacturer claims that Skin-Foil is not hygroscopic, will not dry the skin, will not break up or allow penetration of chemicals through it, and is slightly absorbed into the skin, filling the hair follicles with an inert but easily removable substance. It is insoluble in water but is easily removable with the lather of ordinary soap.

Fairway Heavy Duty Metal Dispenser

The Fairway Laboratories, Division of the G. S. Suppiger Company, 1532 Hadley St., St. Louis, Mo., announce the Fairway Heavy Duty Metal Dispenser which, while incorporating the various characteristics of other models in the line, has an added feature in that it is practically unbreakable.

The dispenser has a special cast alum-

inum alloy body hopper and wall bracket designed to endure the rough handling it may encounter in foundries, steel mills, and similar locations. The well-protected mechanism is made of molded plastic which has proved satisfactory in other Fairway units.

A non-breakable window is located in the hopper so that the supply of tablets may be inspected on sight; the dispenser is also equipped with a visible discharge. This enables the workman by a slight turn of a knob to bring one tablet into place where it remains until removed with the tip of the thumb and index finger instead of merely dropping a tablet into the open palm. Thus the tablets are not subject to contamination from soiled hands.

The dispenser is equipped with a lock-top and key. The reservoir is designed to hold 1,500 ten-grain tablets.



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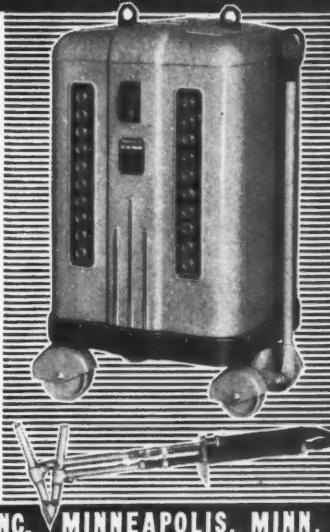
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"Whirlwind" Wire Wheel Brushes

Van Dorn Electric Tools, 720 Joppa Rd., Towson, Md., is now offering a group of high quality wire wheel brushes which are being made by a patented process. The brushes, known as "Whirlwind" Wire Wheel Brushes, are outstanding for their quality and long life, both of which are apparent in the extra density of wire for any given width of brush.

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Ergolyte Continuous A. C. Arc Welders

Ergolyte Continuous A. C. Arc Welders manufactured by the Ergolyte Manufacturing Co., 3644 Lawrence St., Philadelphia, Pa., are said to offer new convenience in welding. All controls and sockets have been brought into full view on a sloped panel, thereby eliminating the necessity for crouching or squatting to select heats or make adjustments. Heats may be selected in gradual steps over a wide range and are correctly proportioned to correspond to the common gauges of metal handled. Insulation is double spun glass.

Ergolyte welders employ a broken wave current produced by a special

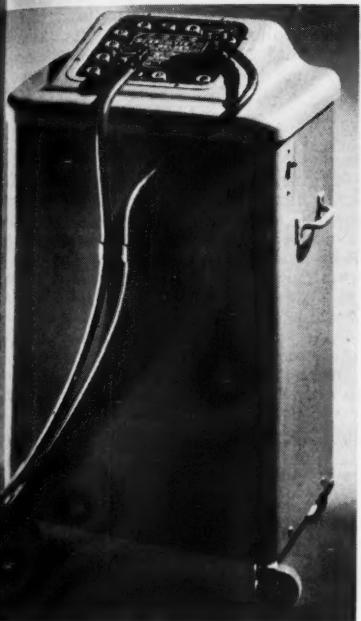
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nding which, it is claimed, makes the welders unusually stable and quiet in operation regardless of how unsteadily the welding electrode is held. Thus, smooth uniform beads and fillets free from undercutting and piling up are said to be possible, with very low spatter loss.

Ergolyte Continuous A. C. Arc Weld-



Ergolyte Model No. 250 Continuous A. C. Arc Welder

ers are available in two models; namely, the No. 160 with a current range of 15 to 160 amperes and the No. 250 with a current range of 15 to 250 amperes. Both models operate on single phase or one phase of 2 or 3 phase current and are furnished complete with helmet, rubber-covered cables, electrode holder, and assorted sizes of electrodes. The current required at no load is claimed to never exceed 50 watts.

"Red Band" Diamond Tools

The Abrasive Dressing Tool Co., 1550 Broadway, Detroit, Mich., announces the development of an improved line of diamond tools to be known as the Abrasive

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"Red Band" No. 11 Diamond Tool

which secures the diamond in the tool for its entire useful life, other exclusive production methods have been used to ensure matchless economy and long life.

Shown in the illustration is No. 11 in the Red Band line, a tool which is

designed for versatility of application as well as general utility. It contains three rows of diamonds, precisely staggered and spaced to permit the wheel to be used for single-stone dressing, cluster-type dressing. By regulating the drag-angle, a single stone or stones may make contact with the wheel. The No. 11 can be used for large radius trueing, surface grinding, medium cylindrical grinding, and other toolroom dressing. The Abranet Red Band No. 11 contains 11 diamonds weighing approximately 1.25 carats.

"Air-O-Chek" Air Gun

A streamlined "Air-O-Chek" Air gun with hardened steel nozzle for blow service where the gun is subjected to severe usage is announced by the A Way Pump & Equipment Co., 581 Van Buren St., Chicago, Ill. The steel clad air gun employs the patented "O-Chek" valve design which is said to require no packing gland and no external levers or buttons.

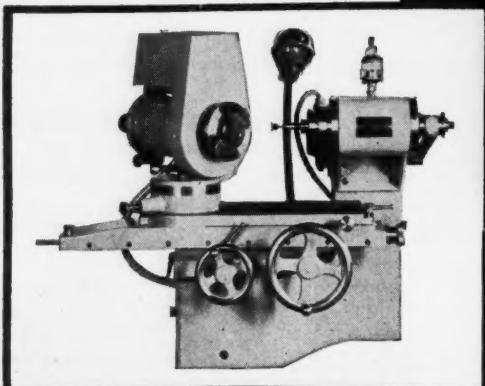
An actuating lever which is connected to the valve by a ball and socket joint extends into the hose of the gun. It

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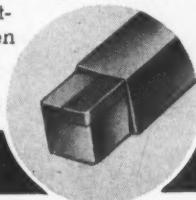
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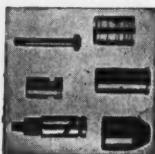
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14. Milling Attachments

Fray All Angle Milling Attachments are illustrated and described in bulletin available from Fray Machine Tool Co., Glendale, California.

15. Tool Cases and Chests

Fourteen types of tool cases and chests for tool makers and machinists are illustrated and described in bulletin available from H. Gerstner & Sons, 1240 Columbia St., Dayton, Ohio.

16. Cut-Off Machine

New, improved Delta Cut-Off Machine is illustrated and described in new bulletin available from Delta Mfg. Co., 634 E. Vienna Ave., Milwaukee, Wisconsin.

17. Punches, Shears, Bending Brakes

Whitney Metal Tool Co., 110 Forbes St., Rockford, Ill., has available Catalog No. 13, outlining ball bearing punches, shears, angle iron machinery and bending brakes.

18. Furnaces and Gas Burners

Johnson Gas Appliance Co., Cedar Rapids, Iowa, has issued a new catalog featuring the Johnson line of equipment including heat-treating and melting furnaces, urn burners, hand torches, etc.

19. Stainless Steel Stock List

This is a handy 16-page Stocklist

SS100 showing size of Rezistal sheets, bars and welding rods carried in Crucible's Mills and Branches. Crucible Steel Co. of America, 405 Lexington Ave., New York, N. Y.

20. Surface Grinder

Bulletin M-644 features Builders' Surface Grinder for grinding tool dies and small machine parts. Builders Iron Foundry, Providence, R. I.

21. Radiation Pyrometer

Catalog No. 100 issued by The Pyrometer Instrument Co., 103-105 Lafayette St., New York, N. Y., features the PYRO Radiation Pyrometer.

22. Balancing Machine

New 6-page bulletin issued by Taylor Sales Company, 2333 W. Clybourn St., Milwaukee, Wis., illustrates and describes the Taylor H-EFF Static Universal Balancing Machine.

23. Broaches and Fixtures

Detroit Broach Co., Inc., 6000 Beneteau Ave., Detroit, Mich., has issued a new 16-page booklet detailing Detroit broaches and broaching fixtures.

24. Diving Heads

The new line of L-W Diving Heads is illustrated and described in new folder available from L-W Chuck Co., 20 N. St. Clair St., Toledo, Ohio.

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2. Flexible Coolant Lines

Folder featuring flexible oil feed and coolant lines is available from American Metal Hose Branch, The American Brass Co., Waterbury, Conn.

3. Square Frame Arc Welder

Harnischfeger Corporation, Milwaukee, Wis., has just released descriptive folder featuring the new P&H-Hansen WD-150 square frame arc welder.

4. Flame Cutting Data

A handy chart reproduced on heavy cardboard gives flame cutting data—hand and machine. Available from Modern Engineering Co., 34th and Pine Blvd., St. Louis, Mo.

5. Industrial Diamonds

New folder has been published by Anton Smit & Co., Inc., 24 State St., New York, N. Y. It illustrates and describes industrial diamonds, diamond dressing tools, diamond drawing dies and other tools. Prices are also included.

6. Principles of Plain Bearing Lubrication

A new 16-page booklet outlining the "Principles of Plain Bearing Lubrication" is available from Tide Water Associated Oil Co., 17 Battery Place, New York, N. Y.

7. Fluorescent Lighting

Fundamentals of fluorescent lighting are detailed in 24-page catalog issued by Westinghouse Electric & Mfg. Co., Lamp Division, Bloomfield, N. J.

8. A. C. Arc Welder

Descriptive catalog E-10 and price list on Ergolyte A. C. Arc Welders is available from Ergolyte Manufacturing Co., 3642 N. Lawrence St., Philadelphia, Pa.

9. Diamond Dressing Tools

Literature and price list on Abrasive Red Band diamond dressing tools may be obtained from Abrasive Dressing Tool Co., Detroit, Mich.

10. Dust Control

79 installation photographs are presented in the Roto-Clone Dust Control book now available from American Air Filter Co., Inc., 702 Central Ave., Louisville, Ky.

11. Carbide Tool Grinder

Thomas Prosser & Son, 120 Wall St., New York, N. Y., has issued literature illustrating and describing the Prosser Carbide Tool Grinder.

12. Drill Grinder

Details of the Black Diamond drill grinder are outlined in Bulletin No. 121. Black Diamond Saw & Machine Works, Inc., 45 North Ave., Natick, Massachusetts.

13. Machine Tool Motor Drive

A complete line of transmissions for motorizing all types of machine tools is illustrated and described in bulletin released by Western Manufacturing Company, 3428 Scotten Ave., Detroit, Michigan.

Reed Micrometers, now being marketed by the George Scherr Co., Inc., 130 Lafayette St., New York, N. Y., are presented by means of illustrations and descriptions in a four-page folder now being published by this firm. Copy free upon request.

"Research . . . Another Phase of Norton Service" is the title of a four-page folder containing a series of questions and answers given in an interview with the director of the Norton Research Laboratories. Copy of the folder can be obtained by writer to the Norton Company, Worcester, Massachusetts.

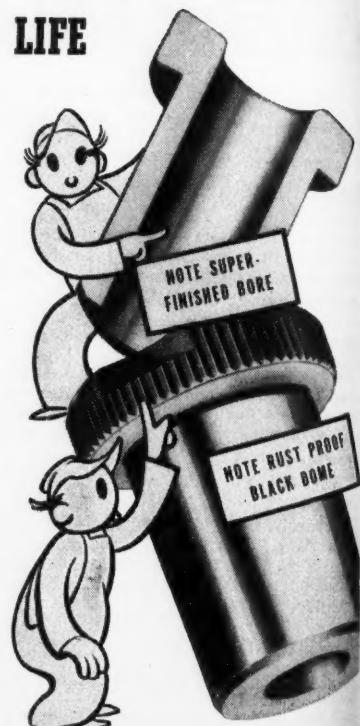
"Diamonds for Industrial Purposes" is the title of a four-page bulletin illustrating and describing some of the many industrial diamonds, diamond cutting tools, dressing tools, core bits, drawing dies, pencil points, and so on, marketed by Anton Smit & Co., Inc., 24 State St., New York, N. Y. Copy free upon request.

Lincoln Welding Electrode Chart. A chart attractively printed in color and giving uses, physical characteristics, and so on, as well as currents and procedures for some 36 different electrodes has been prepared by The Lincoln Electric Co., Cleveland, Ohio. The chart should be of value to shop superintendents using welding and, since the physical characteristics of weld metals are given, should also be of value to designing engineers.

Chart is available free of charge to anyone addressing a request on his company letterhead.

Cincinnati No. 2 Centerless Grinding Machine. Specifications, illustrations, and a description of the Cincinnati No. 2 Centerless Grinding Machine are given in a 16-page bulletin, designated as G-456, which is now being distributed by Cincinnati Grinders Incorporated, Cincinnati, Ohio. The Cincinnati centerless method of grinding and four time-saving advantages of centerless grinding are discussed. In addition, the bulletin contains illustrations and a discussion of the various accessories and attachments available for the No. 2 centerless grinding machine at extra cost. Copy free upon request.

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"Planning the Industrial Apprentice Training Shop." The urgent need for skilled machinists has created a demand for vocational training that necessitates an immediate increase in apprentice shop facilities. Vocational school men who are confronted with the problem of enlarging old shops or planning new shops will find much helpful information in a timely publication entitled "Planning the Industrial Apprentice Training Shop" recently announced by the South Bend Lathe Works, 977 E. Madison St., South Bend, Indiana.

The publication contains a number of practical shop layouts planned for really efficient vocational training. Methods of organizing shop work, suggestions for selection of equipment, and lists of tools and accessories for various sizes of industrial apprentice machine shops are included. Most helpful of all, perhaps, is an inquiry form for requesting a shop floor plan layout to be made by the engineering department of the South Bend Lathe Works. The floor plan layout service is offered free of charge and without obligation to anyone desiring assistance in planning a machine shop.

Copy of "Planning the Industrial Apprentice Training Shop" can be obtained

free of charge by writing to the South Bend Lathe Works at the above address.

"Principles of Plain Bearing Lubrication," a 16-page illustrated booklet now being issued by Tide Water Associated Oil Co., 17 Battery Place, New York, N. Y., is a comprehensive presentation of modern lubrication practices as applied to plain bearings. Under a section entitled "Fundamentals of Lubrication," the booklet describes the laws of friction and the hydrodynamic theory of lubrication, as well as boundary lubrication and extreme pressure lubrication. The text is supplemented by schematic sketches and curves.

Among other general headings that are broken down and discussed in detail are "Bearing Design and Grooving," "Method of Oil Application," "Selection of Lubricants," "Grease Lubricated Bearings," and "Diagnosing Bearing Troubles." In conclusion, the booklet contains recommendations for various types of lubricants to be used for certain applications. Copy free to plant executives upon request.

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Forsberg "Whale" and "Viking Tools Catalog No. 40. A general catalog featuring the complete line of "Whale" and "Viking" brand tools marketed by The Forsberg Mfg. Co., Bridgeport, Conn., has been released by this firm. The catalog consists of 64 pages, several of which contain colorful illustrations of the various tools. The catalog describes the salient points of each tool listed and gives helpful and valuable data to metal cutting tool users.

The arrangement on each page of the catalog is such that the class numbers and list prices are near the outside edge of the page—a decided advantage when separate pages or the complete book is used as a part of a distributor's or jobber's catalog. Whale brand tools are quickly identified by a brilliant orange-colored border on the edge of the page and the Viking tools by an edge of green.

Among the tools featured in the catalog are various types of hack saw blades, metal band saws, hack saw frames, mallets, hammers, coping saws and blades, cop saw frames, screw drivers, hand drills, micrometers, awls, putty knives, and scrapers. Copy of Catalog No. 40 free to mechanical executives.

Harnischfeger Equipment Bulletin X-5-40. A concise, ready-reference catalog on new, used, rebuilt, and surplus stock has been issued by the Harnischfeger Corporation, 4535 W. National Ave., Milwaukee, Wis. The catalog lists excavators, cranes, engines, motors, hoists, and miscellaneous electrical, shop, powerhouse, and foundry equipment, together with the price, condition, and location of each item offered. Equipment is indexed and arranged for quick reference. Copy of Bulletin X-5-40 free upon request.

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of much material which is no longer vital. However, it has been necessary to add more than two hundred text pages and rearrangement of sections has seemed advisable.

The volume is divided into 28 main sections for which, including the subject listings, 12 pages of index are required. The main section headings are as follows: 1—Screw Threads. 2—Pipe and Pipe Threads. 3—Drilling. 4—Reamers and Reaming. 5—Taps and Tapping. 6—Files and Work Benches. 7—Bab-
bitting, Brazing, Soldering and Welding. 8—Gearing. 9—Turning and Boring. 10—Milling Machine Feeds and Speeds. 11—Grinding, Honing and Lapping. 12—Screw Machine Tools, Speeds. 13—Punch Press Tools. 14—Broaches and Broaching. 15—Bolts, Nuts and Screws. 16—Measuring and Fitting. 17—Tapers and Dovetails. 18—Shop and Drawing Room Standards. 19—Wire Gauges and Stock Weights. 20—Horse-power, Belts and Shafting. 21—Metals and Other Materials. 22—Machine Forgings. 23—Knots and Slings. 24—General Reference Tables. 25—Automotive Data. 26—Railroad Shop Data. 27—Shop Trigonometry. 28—Dictionary of Shop Terms.

In addition to the information pro-

vided under each heading, the text includes articles on such special subjects as the use of wire size formulas in measuring screw threads, new data on diamond tools, new grinding wheel markings, superfinishing, practical methods of screw machine cam design, new heat treatments of new steels, new data on hardness tests, and so on. Every section in the book has been thoroughly revised and some of the sections have been entirely rewritten.

New Literature

"Worth Their Weight in Gold" is the title of an informative broadside on Trico "Kliplok" Clamps for fuse clips which is now being published by the Trico Fuse Mfg. Co., Milwaukee, Wis. The broadside tells how poor contact wastes millions of dollars, tells how the trouble of poor contact starts, and describes how premature fuse blowings, arcing at contacts, wasteful shutdowns, and unnecessary loss of production can be eliminated by locking fuses and clips together with Kliplok clamps. Copy free upon request.

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New Books

Know Your Steel. By Halfdan Halvorsen. Published by the author at P.O. Box 63, Harper Station, Detroit, Mich. 109 pages. Size, 3 1/4 x 6 1/2 in. (For pocket use.) Bound in flexible imitation leather. Price, \$1.50.

Compiled for the use of the steel user and steel heat treater, this pocket-size book contains, in concise form, a list by name or other identification of all of the various steels made and marketed in the United States, segregated under headings which indicate their special characteristics such as Alloy Tool Steels, Special Alloy Steels, High Carbon Alloy Steels, Non-Deforming High Manganese Types, Fast Finishing Steels, High Speed Steels, and so on. Notes as to special heat treatments or temperatures at which the steel should be forged, annealed, hardened, quenched and drawn, are included for practically all of the steels by name. Instructions for heat treating are given for SAE carbon steels, screw stocks, alloys, and other steels, by the SAE identification number.

A special section gives heat temper-

atures in C. and F. and colors for hardening, also heats and temperature colors of steels. Included in this section is a table of relative comparisons of Rockwell, Scleroscope and Brinell hardness numbers, approximate melting points of materials, and properties of chemicals used in steel treating.

American Machinists' Handbook. By Fred H. Colvin and Frank A. Stanley. 7th Edition. Published by McGraw-Hill Book Company, Inc., 330 W. 42nd St., New York, N. Y. 1,350 pages, 4 x 6 1/2 in. in size; 2,500 illustrations, diagrams, and tables. Bound in cloth. Price, \$4.00.

More than 30 years have elapsed since the first edition of the "American Machinists' Handbook" was published and many changes have taken place. Screw threads, fits, and machine tool parts have been standardized and new materials have been developed for which new cutting tools and methods of handling have become necessary. These changes have made necessary the addition of much new data, but the increase in the size of the book has been kept at a minimum by the elimination

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Drafto 30 Series and 35 Series Drawing Machines

The Drafto Company, Cochranton, Pa., has brought out two new series of drawing machines, of the usual Drafto portable type, including three sizes in the No. 30 Series and four sizes in the No. 35 Series. All seven of these machines are made with protractors of stainless steel, graduated by the use of a machine

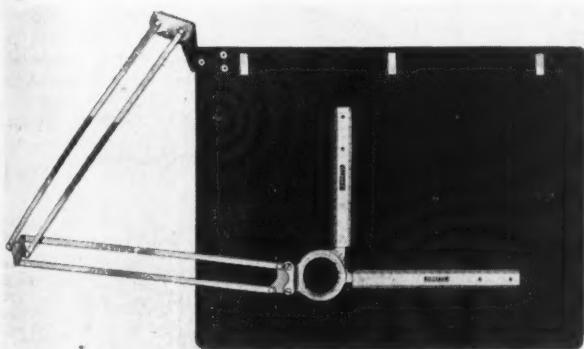
ing that this firm has been able to find to date. The Model 35C-8-12 is, however, mounted on a first-quality seasoned wood board. All of these models take the present Drafto standard detachable scales. The Masonite boards are finished in green and the arms are of chrome steel with bright chrome finish on the top side and dull chrome on the bottom. All other parts are finished in dull chrome plate.

Size No. 30H-6-8 takes 12 x 18-in.

sheets of drawing paper and is available complete with 6 and 8-in. detachable scales. Size No. 30V-6-8 is the vertical type, otherwise exactly the same as the No. 30H-6-8. Size No. 30U-6-8 is marketed unmounted; that is, without Masonite board or paper clamps, otherwise it is the same as the No. 30H-6-8.

Size No. 35H-8-10 takes 15 x 20-in. sheets of drawing paper and is marketed complete with 8 and 10-in. detachable scales. The

No. 30U-8-10 is the same as the No. 35H-8-10 except that it is marketed unmounted. The No. 35C-8-12 takes 18 x 24-in. sheets of drawing paper and is marketed mounted on a 23 x 31-in. seasoned wood board. It is complete with 8 and 12-in. detachable scales. Size No. 35CU-8-12 is marketed unmounted; that is, without the wood board but with mounting bracket for mounting on the customer's own board. It is complete with 8 and 12-in. detachable scales.



Model 35H-8-10 Drafto Portable Type Drawing Machine

built especially for this operation. Thus it is said that the graduations are extremely accurate and with the vernier that is attached to the back plate, it is possible to set one of these machines to one-half degree. The latching features makes it possible to latch the protractor accurately at 0, 35, 45, 60 or 90 deg. either side by zero.

The boards on all of these models except one are made of Masonite, this being the most perfect surface for draw-

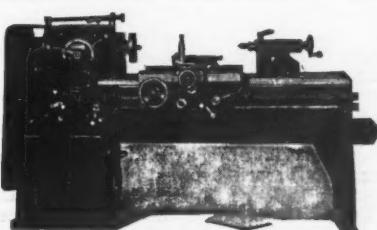
"C & J" 15" and 16" Lathes

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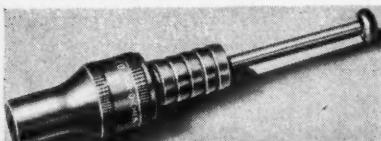
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ing the hose slightly between the thumb and fingers deflects the lever and opens the valve. When the hose is released, the valve closes instantly with a leak-proof seal. The simple valve mechanism

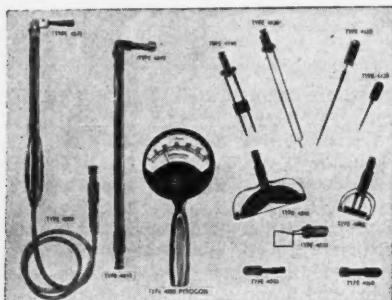


"Air-O-Chek" Air Gun

is made of bar brass and stainless steel and is shielded by the hardened steel nozzle and hose of the gun.

Improvements in Pyrocon Surface Pyrometer

Illinois Testing Laboratories, Inc., 420 N. La Salle St., Chicago, Ill., announces that the Type 4000 Pyrocon Alnor Surface Pyrometer made by this firm has a heavy rugged movement which is said to be highly essential in a portable py-



Pyrocon Improved Surface Pyrometer

rometer. The user has a choice of either rigid or flexible arms or both, the arms being instantly removable and interchangeable. Instant interchangeability of different thermocouples is now possible with any Type 4000 Pyrocon without adjustment or change in calibration. The choice of seven standard temperature ranges is now available.

Junction errors are said to be eliminated by the use of the same material for both yoke of arms and plates of the thermocouple assembly and the thermo-

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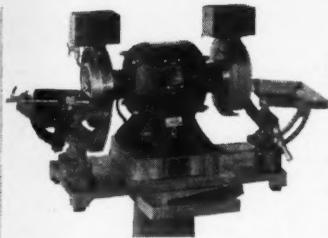
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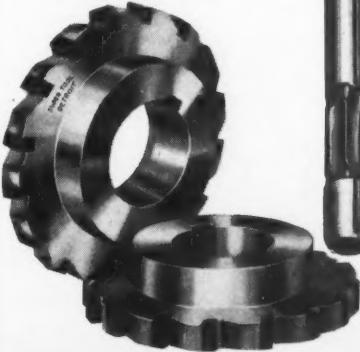
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SPECIAL APPLICATIONS

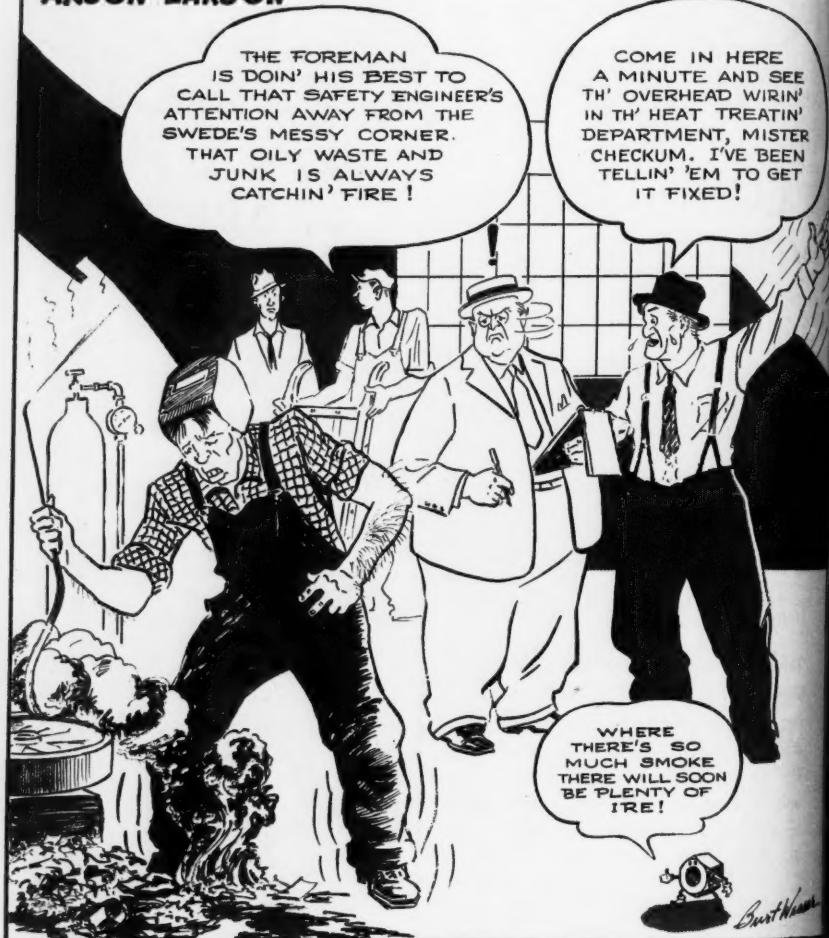
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"Meco" Gas Welding Equipment Catalog No. 110. The complete line of "Meco" gas welding equipment available from the Modern Engineering Co., 34th and Pine Blvd., St. Louis, Mo., is profusely illustrated and described in a 32-page catalog now being issued by this firm. Among the Meco equipment listed are various types of oxy-acetylene welding torches, cutting torches and attachments, welding tips, tip drills, roller

guide and compass attachments, cutting torch tips, regulators, regulator adapters, lead burning torches and attachments, soldering and brazing torches, acetylene generators, goggles, wrenches and numerous other pieces of welding equipment.

Also included in the catalog is a chart containing complete hand and machine flame cutting data. Copy of Catalog No. 110 free upon request.